See Back Cover !

POPULAR AVIATION

JANUARY 25c
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P-B
v.16-17

Bristol Fighters
See Page 40

HERMAN Bull

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My graduate, R. N. Dobbins, got a job immediately after finishing my course as Chief Instructor at a big Aviation School in New York earning $75 a week.

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Again the Aviation Industry places its stamp of approval upon Parks Methods and Parks Graduates.

A graduate of July, 1934, writes about it from one of the largest aircraft factories in America, where he is employed. There had been a brief shutdown to permit rearrangement of the plant, and also—here is something to ponder over—to permit the elimination of the less efficient men.

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The business of Parks Air College is twofold:

First: Provide the technical and practical training necessary to enable its graduates to make a desirable connection in the aviation industry, and

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WELDING DEPARTMENT

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Owns its own airport of 100 acres.

Has 14 buildings with a total floor area of 119,352 square feet (2¾ acres) all devoted to school purposes.

3 dormitories and a cafeteria are operated for Parks students.

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Offers complete course in radio beam and instrument flying.

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Graduates with every leading aeronautical concern in America and in many foreign countries.

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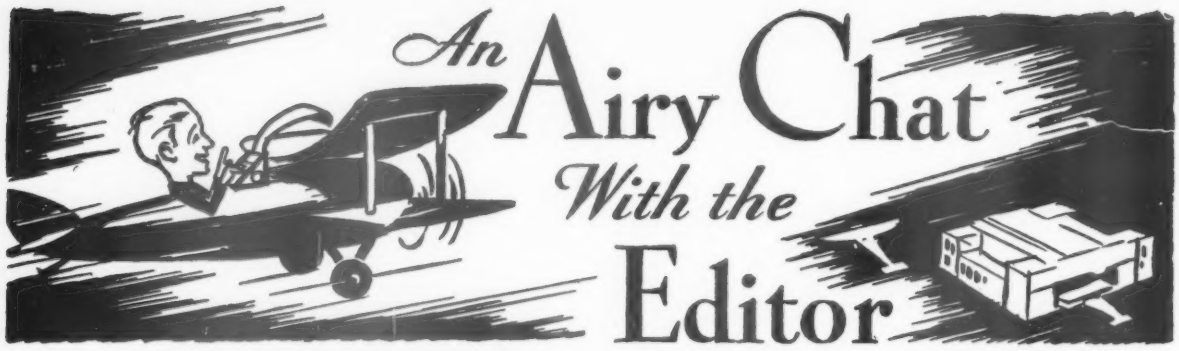

An Airy Chat With the Editor

WELL, that London to Melbourne race is all settled and a thing of the past. Our compliments go to the winning British plane and to the American ships that did so well in the contest.

We got a big kick out of the race investigating committee who tried to discover what regiment Roscoe Turner belonged to. They couldn't find anything in the military books that showed a uniform like the one that Col. Roscoe parades in. We just can't remember any military regalia that calls for pink panties coupled with a French blue coat and yellow puttees.

* * *

A RACE like that Melbourne affair is a race well worth running. It is entirely out of that deplorable class that considers pylon polishing the ultimate in contests. In a long overseas and overland race, all the details of good flying practice are thrashed out and proved or disproved. This is a real test of the ship, men and methods.

* * *

WE feel that this issue carries a story of more than ordinary interest. It tells of a very early pioneer in flying who has been ignored up to the present time. Few people have ever heard of Whitehead, yet he flew very early in the game—before the Wrights. Whitehead was reticient and overcautious. He did not seek publicity for his machine because he believed that the airplane was not the final answer to the flight problem and he held off publicity until such time as he could devise a suitable direct lift machine on the helicopter principle.

* * *

WE HAVE a fine letter from Charles H. Dix, Box 16, Council Hill, Oklahoma, who encloses a newspaper clipping concerning the war now being waged on amateurs in Ohio. Because James Lee, 33, builder and pilot of a homemade plane was killed when his ship went into a spin and crashed, the state authorities of Ohio are taking steps to entirely suppress amateur aviation in that state. However, we note that they do not undertake the job of grounding commercial airplaners who have a longer roll of crashes and death than the amateurs. Here is what Mr. Dix has to say:

It is nothing less than a rotten shame that such laws concerning aviation have been passed in our states. The worst part of it is that most of our supposed honorable congressmen are just a bunch of . . . . . who have never been on an airport, let alone being up in a plane. As in many other industries, they are influenced by the big money men of aviation to keep the little man down and out. Most of them know no more about aviation than the layman.

With all the talk about a New Deal, I think it is about time for a new deal for the amateur in aviation. The Army Air Corps kicks out more of its recruits than it accepts because they are not 100 percent perfect. Look at the cost of a good flying course and the cost of a manufactured airplane. Many cannot meet this expense, and what do they do? They become corset salesmen and do their flying in a Model "T" Ford.

Many talk about the freedom everyone enjoys in the good old U.S.A., but possibly they have never heard of amateur aviation. We all know how much liberty the amateur enjoys.

This letter sets forth the ideas of most of us, Mr. Dix, but unfortunately we can do nothing about it. All sorts of associations have been formed to combat the evil but oppressive aviation laws continue to grow more oppressive in spite of the protests.

* * *

STRATOSPHERISTS continue to come down regularly with a big bump. Jean Piccard took a ten-mile jump upward and then came down b-oo-n-g in a clump of trees. Who said that ballooning was an old lady's game?

* * *

I HAVE been in receipt of a great many letters calling my attention to the reputed 440 m.p.h. made in Italy. This does not disturb me in the least, for to increase the speed from 423 m.p.h. to 440 m.p.h. required a 3,500 h.p. engine instead of the previous 2,500 h.p engine. A good 1,000 horsepower was required for gaining the additional 17 miles per hour, just exactly as my chart showed. And don't forget, they are still a good 60 m.p.h. short of 500 miles per hour!

* * *

G. W. RHODES, 1721 L Street, Auburn, Nebr., has a new idea. He would like to see a club formed of amateurs using Ford engines. Furthermore, Mr. Rhodes would be willing to pledge from $95 to $150 on the new projected Ford aviation motor that we spoke about in the October issue. He believes that many others would do the same if Mr. Ford and the Bureau of Air Commerce would cooperate to get licenses for planes carrying Ford motors. Again, the required production of 10,000 motors would be assisted by the purchases of speed-boat fans who would be glad to get the revamped Ford engine.

This mag thinks that this idea is a fine one. A Ford Motor Flying Club would really get somewhere because, when the fellows are banded together, they can work out a whole lot of improvements on their ships, engines and accessories.

* * *

THE SUBURBAN Aero Club, 27 Chester Pike, Darby, Pa., is being sponsored by three students of the Rising Sun Aircraft School, Philadelphia, Pa. Classes will be conducted in all phases of aviation with a view of acquiring an Amateur and Private Pilot's license. For full information, write to the Suburban Aero Club, care of Thomas J. Pohlig, 27 Chester Pike, Darby, Pa.

* * *

MERCIFUL HEAVENS! What a deluge of dream-ships has broken in on us again. To publish all the slumber-buggies that have been unloaded on us during the past two or three weeks would require a book of about 300 pages devoted to nothing else than readers' idea. It is impossible—absolutely—to even dream of exhibiting all that have been submitted, so please don't feel hurt if your cherished windsplitter does not appear. Many very good ones have been side-tracked with much regret on our part.

* * *

THE INSIGNIA on our next back outside cover has been the subject of a lot of correspondence, letter writing, etc. Letters on this subject have been received from all over the world, and we've had a hectic time making translations, matching colors and all the rest of it that goes with the reproduction of national insignia. The

(Continued on page 60)

POPULAR AVIATION

Including SOUTHERN AVIATION and AERONAUTICS

A MAGAZINE FOR THE PROMOTION OF AMATEUR AVIATION AND PRIVATE FLYING

Volume XVI JANUARY, 1935 Number 1

NRA CODE

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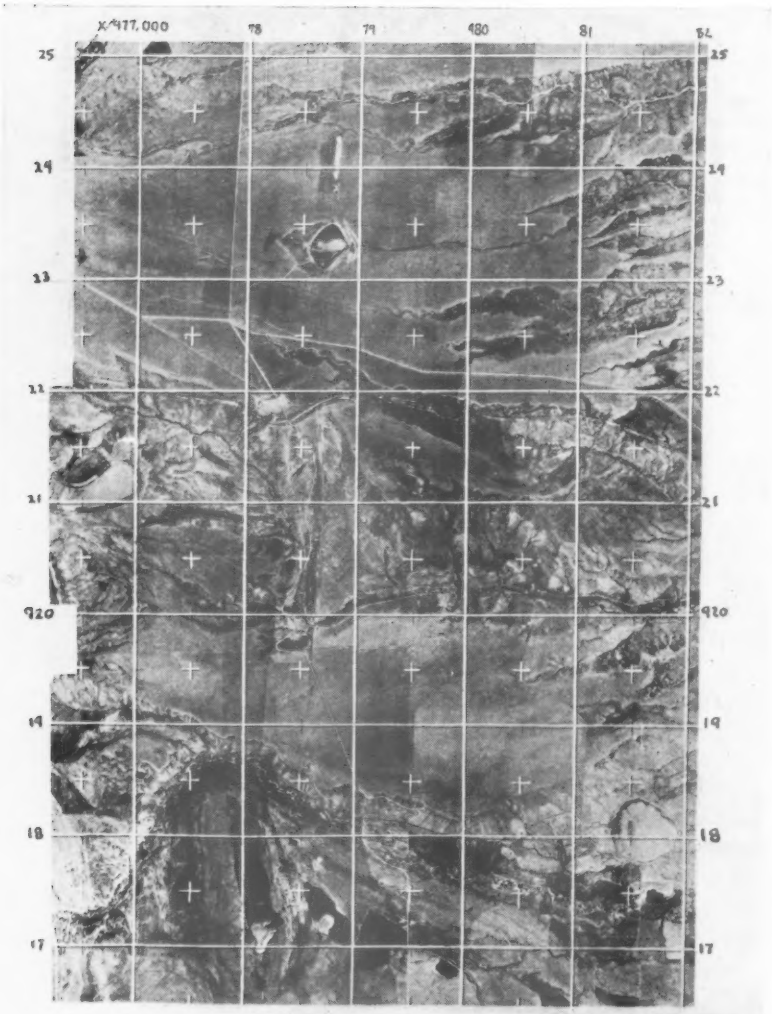
Topographical Mapping

by

T. R. WISEMAN

Expert in topographical mapping and aerial photography.



A reduced reproduction of a mosaic. These prints would be pasted together on the 1,919,000 grid-line horizontals. While the squares are shown here by white lines in practice, only the closest observation can detect where the squares are pieced together on the actual prints.

A PRICELESS pearl may be only a painful appendix to an oyster, but to us it is a particle of divine beauty. Similarly, stereopticon views may be only a funny or painful memory to you, but to the Photographic Unit, "the eyes of the army," the stereoscope is priceless.

Do you remember the old two-eyed trombone "stereoscope" that Grandma kept on the marble-topped stand in the parlor? Remember how objects stood out in those pictures as though outlined by a faint rainbow? Well, this same principle is applied in the army to a machine which can detect secrets hidden from even the most keen-eyed scout.

This new machine is also called a stereoscope. A heavy frame holds two mirrors at forty-five-degree angles to the pictures. Two glasses in the center are placed lower than these mirrors and parallel to them. Two prints of the map picture are placed beneath the glasses. The angle of mirrors and glasses causes a refraction which builds up the picture, showing shadows and differences of heighths.

In this way, the tiniest "pin-point" details are registered by the eye of the camera—and by placing the pictures under the machine, the details are revealed to the eye of the observer. Even camouflaged objects can be detected—for even the best of disguise casts some shadow.

The pictures are taken in the first place by a vertical camera from an observation plane. They look like ordinary pictures to the casual glance, but two views of each section are taken, with a sixty percent overlap. They are called "pin-point maps," taken to focus some particular area under discussion. One is marked "left" and the other is marked "right," so that they will not be confused.

If the pictures are reversed under the stereoscope an opposite effect is accomplished. Hills become hollows, streams run down ridges of mountains, and buildings become cellars.

Vertical pictures taken by these units are used also to build mosaic maps. When used for this purpose, a sixty percent overlap is allowed for accuracy, to take care of distortions. In a vertical picture, only the center of the camera is absolutely accurate and any differences in height or other irregularities of the picture, will cause errors in accuracy.

Therefore, in making maps of large sections, these smaller maps are pieced together into mosaics of the entire region under observation. The average number of maps used in a mosaic is three hundred, and sometimes a large area map is composed of more than five hundred pieces.

Each mosaic is like a single large map when completed and the joined places are hard to find if the work has been properly done.

This patchwork is started in the center, because by building out from the middle there is less likelihood of error. Sometimes before the mosaic is completed, the center piece is close to being completely shut out. The one in the accompanying illustration is about the size of half a dollar, although originally it was an eight- by ten-inch picture.

Where a high bluff goes through the picture near the middle, that picture is cut for piecing along the bluff and only half of it used, so the error caused by heighth will not interfere with the accuracy of the overlap of the next picture.

Each mosaic is scaled according to a United States Standard Grid Zone. On this grid zone scale the "x" lines are vertical and the "y" lines are horizontal.

The center "x" line on Zone "C" is called the one-millionth yard line.

There are seven zones, across a map of the United States, lettered from A to G, and they are nine degrees in width

By Aerial Photography

THIS most interesting and instructive article on aerial mapping, shows just how the "mosaics" are taken and pieced together. It is maps of this type that are so useful in civilian surveys as well as to the Army in wartime.

with an overlap of one degree of longitude between zones. Each "x" line is one thousand yards from the next one. "Y" lines are similarly placed. For this reason no map ever runs out of yardage and they are accurate to the detail of a pin point.

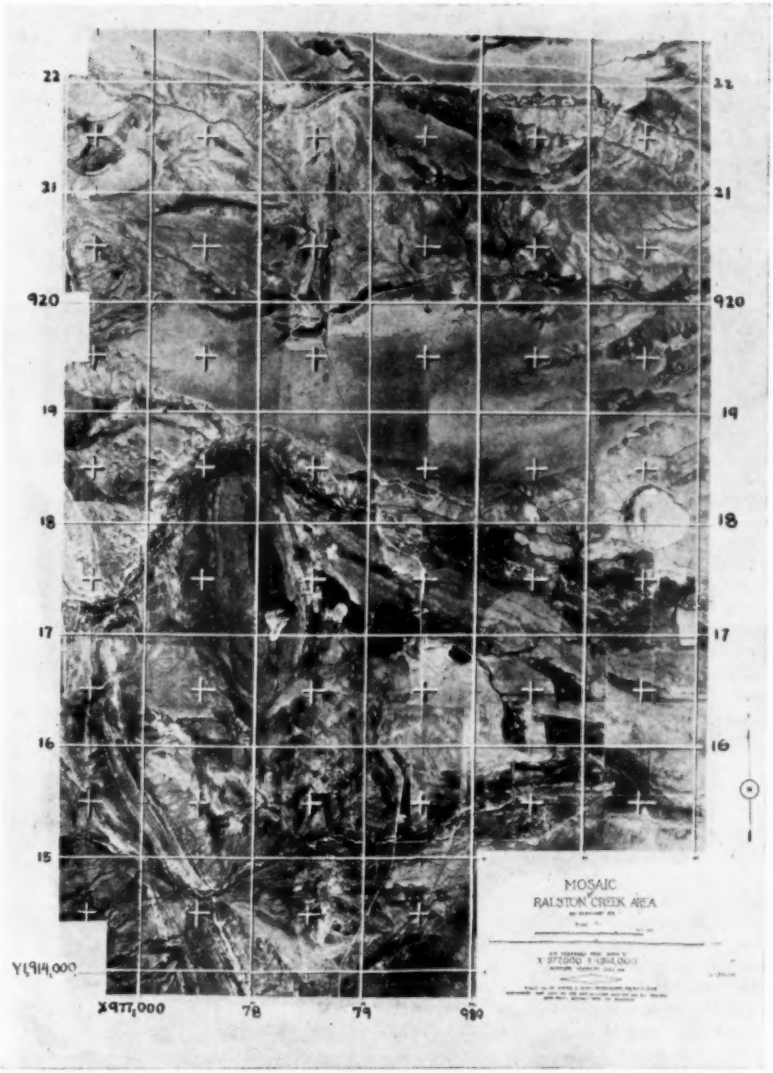
For military purposes, the users of this map can indicate by yardage any particular point in complete detail. For instance, a military observer in a plane, on a mission over enemy territory, can indicate by yardage the definite object which must be destroyed by radioing the directions to the artillery. Behind the lines, an artillery officer can check on his own map and direct long distance gunfire at the distant object, which may be completely out of sight.

In all divisions of the army the same service is equally valuable. For General Headquarters Staff work the mosaic maps are invaluable. They show the quality of ground under dispute as well as locations of towns, isolated farms, water, railroads and possible natural defensive terrain. They show without disguise just what difficulties in foot work the infantry must overcome to gain disputed territory by an advance.

In the Intelligence Service, even greater importance can be attached to these maps. Perhaps a sector of ground is quiet. There is no reason to suppose that there will be any attack at this point. A photographer notices under stereoscopic examination of a map that it differs in some slight detail from one taken a day or two before.

The Intelligence Service traces down the change and discovers a small concealed road has been built or a short branch added to the railroad siding. This discovery may save an entire section if the change in road meant secret movement of troops, and it was found in time to checkmate the enemy.

These small pieces of maps are so carefully joined in the mosaic that copies of it can scarcely be told from ordinary vertical pictures. This is accomplished by feather-edging. Each line where the join is to come, is cut lightly through with a razor. Then the under side is pulled away from the print in an uneven line. A heavy mucilage is spread over the back and worked into the paper and the piece carefully placed on the section it is to fit. These maps may be soaked apart, but only a great deal of water will affect the glue.



The second half of the mosaic (see opposite page). These two maps are composed of 75 eight-by-ten vertical map-pictures. A similar map on the same U.S. Grid Scale would be used for radio directed long-range artillery fire. Photo taken by the 120th Photo Section, 45th Division, Aviation.

The eye of the vertical camera rests in a hole in the floor of the plane. A clock times the overlap so that unnecessary film will not be used. The interval between photographs is checked by the view finder. This interval varies according to the altitude, the focal length of lens, and the speed of the ship.

An "intervalometer" is an electrically operated device which automatically trips the shutter, winds the film and resets the shutter for the next picture. This interval is regulated in seconds by a dial on the front of the intervalometer.

The cameras are semi-automatic, so that all operations can be done by hand if necessary. The direction of crab adjustment and the leveling must be done by the photographer. In both oblique and vertical pictures the single lens camera is used. It weighs about thirty-five or forty pounds.

In the accompanying oblique picture of the squadron in flight formation over Pike's Peak, the photographer held the camera over the side of the ship, standing in an open cock-pit. They were flying at a rate of one hundred and twenty miles an hour in a forty below zero gale of wind. The camera man's nose and mouth were all badly frosted when he reached the ground.

Oblique pictures are made over the

XUM

side of an open ship, or through the door of a cabin plane, the camera being held in position by the photographer to correct the crab of the ship.

Sometimes a blue haze, composed of moisture reflecting the sun's rays, covers the ground and interferes with aerial photography. Filters are used to cut out this haze. There are four of these, and they are like an extra glass, fitting over the lens on the outside. They are called Aero One, Aero Two, Minus Blue, and Red Twenty-five. Each is capable of filtering haze just too heavy for the preceding glass. The fourth, Red Twenty-five, is red and is most efficient of all. All the others are yellow color, in spite of their names.

Red Twenty-five is made of two flat glasses, ground to fit the camera lens, with celluloid light filters hermetically sealed between the glasses. Dust and smoke haze are the only interferences which will not be cleared by Red Twenty-five except at times when the haze is so thick nothing will filter it out. Red Twenty-five is not used unless necessary because the red filter tends to cut down the light entering the lens.

Film is developed in rolls seventy-five feet long, in these army Photographic Units. A special automatic developing machine is used which develops the whole roll at one time. Cameras, stereoscope, and developing machine can all be packed into compact units and easily moved when the unit is in action on the field.

At a recent test conducted by a National Guard Photographic Unit, the pictures were taken on a mission twenty miles from the field, the film was developed and pictures were printed and delivered within twenty minutes from the time they were taken. This was done by preparing film in cut lengths, using a car to carry film from plane to developing room and printing the copies while the film was still wet.

Regular army photographic units have planes equipped with a flying laboratory in which rush photos of small areas can be developed while returning from the enemy territory and finished prints delivered in a short time after landing.

Some time ago, a machine was submitted to a National Guard Photo Unit for testing. The first sergeant and his assistant sergeant, agreed that it was a big improvement over the old method because all of the film could be submerged at once, rolled through the developer and then through the hypo by a small hand crank. They felt, however, after winding the film through by hand, that a motor attachment would be a welcome improvement. Since they had been asked to recommend changes or improvements, in a humorous vein they suggested a motor winding attachment for this recommended improvement to divisional experimental headquarters.

Imagine their pleased surprise when the new developer for that unit arrived. They found it was equipped with a motor winding device as they had suggested.

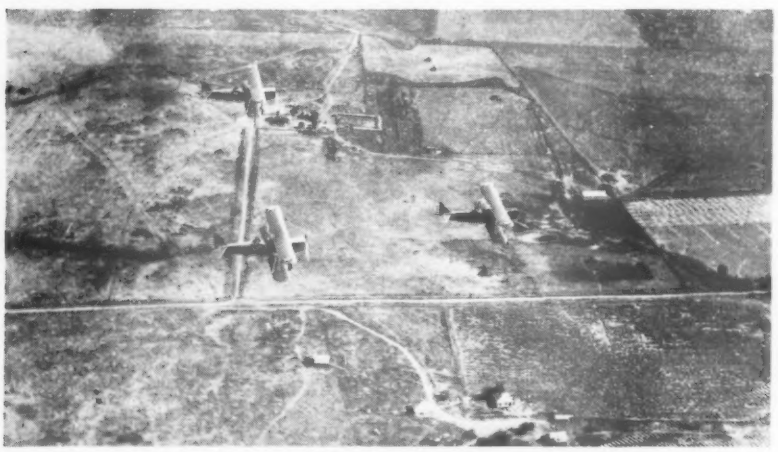
Film is dried by rolling the entire seventy-five feet on a big wooden rack. It is fastened at both ends and carefully wiped on both sides to take off the blur. The entire roll is developed and lettered without cutting.

Great care must be exercised at this time to prevent dust particles from settling on and sticking to the soft emulsion, for a speck of this sort is likely to lead to error in reading the recorded image. Similar precautions must be taken that are not necessary with ordinary photos.

The work of these Photographic Units takes in other things, such as photographic graphs, making pictures of wrecks for the records, photographs of the officers and frames for them, and Christmas cards for the squadron's official use, as well as other light touches far afield from the grim work of the field artillery and the Intelligence Service.

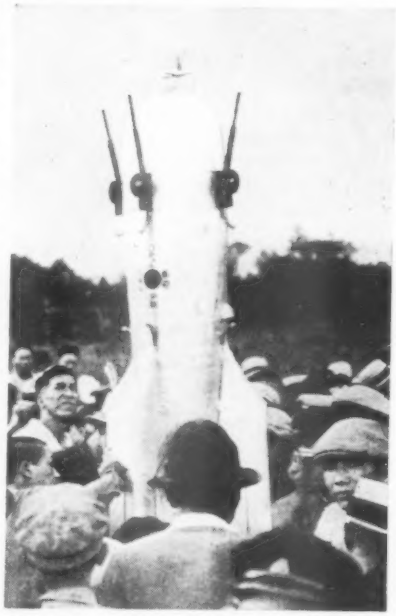
Even in lighter moments, however, the underlying reason for it all is constantly present. They are the eyes of the army. Even in practice, or in lighter moments, they must be accurate, swift and piercing.

END



Observation planes of the 120th squadron flying over Fort Sill, Post Field, Oklahoma. This photo was taken by the 120th Photo Section, 45th division, Aviation.

A Japanese Rocket



This rocket has created intense interest in Japan and much speculation.

THE photo above shows one of the preliminary rocket experiments now being made in Japan by the Nippon Rocket Society of Tokio.

This rocket-ship was invented by Tsunenoo Ohara, who is standing directly to the left of the rocket. The fuel employed is a secret composition but it is known that liquid oxygen is employed as the oxidizing agent. Control is had through the short radio antenna.

Static May Be Eliminated

FOR years, the dream of radio engineers and listeners as well has been the elimination of static.

Today, this dream has been realized by the radio department of Transcontinental & Western Air, whose planes are in constant radio communication with the ground as they fly across the continent, linking the Atlantic ocean with the Pacific.

The use of anti-static headphones for the pilots as well as for the ground station operators has completely eliminated all troublesome static. The new type headphones are equipped with a special diaphragm in which oscillations are limited or "dampened" with the result that even the heavy bursts of static sometimes heard during a thunderstorm are quieted to a mere murmur. The voice and code radio signals are easily distinguished above the static.

While this anti-static principle has been developed for us on TWA planes, without doubt it will be adopted shortly for "home" radios, thus bringing another development of the airways directly into millions of American homes.

Mal Freeburg—Airline Ace

by MAX KARANT

In this thrilling article, written from an interview with Mal Freeburg, the author sets forth the fact that romance and adventure can be written around the commercial airways as well as around military aviation. This is an authentic story approved by Freeburg.

FROM his lofty perch, a half mile up in a moonless black sky, a Northwest Airlines mail pilot peered over the rim of his cockpit at the sleeping Wisconsin countryside. Aside from the occasional glimmer of the headlights of a late-traveling automobile or the flicker of a night light in some lonely farm house, the earth, so far as the flyer's keen eye could see, was covered by an inky pall.

The steady, monotonous whistle in the earphones of his airway radio receiver and the dull gleam of his instrument panel bound him with invisible strands to the sleeping world below. Now and then a slight touch of his hand would counteract a rising or falling air current. Once again assuring himself that his compass needle and directional radio beam were working together in their task of guiding him to Chicago, he squirmed about in his parachute harness until he was comfortable. Force of habit kept him staring into the black void ahead of and below him as though he almost expected something to happen.

Happen? That's a laugh. Why, he had been flying that Twin Cities-Chicago run for so long he could tell you that, according to his watch, he was directly over Farmer Thirteen-Cows-And-A-Ford-Roadster's pasture. Yep, and, according to the same watch, there should be a C. B. & Q. crack passenger express also heading for Chicago over there to the left a bit. Sure enough, there she was straining through the night, her suddenly opened fire box a flaming speeding beacon.

The pilot, Mal Bryan Freeburg, grinned at the "speed" of the train below him and pulled his worn helmet a notch tighter to keep the strong, steady slip-stream from giving him a headache. His glance fell on the instrument panel and he idly watched the needle of his airspeed dial hover near the 120 mark. Each speeding minute meant added flying time to be entered in his log book. Why, just the other day he had checked back and found a total of 6,200 flying hours to his credit. That is a long time—whether you're flying the mail or bucking politicians who don't think you should. And 3,600 of those hours had been flown at night and not infrequently he had envied the earth-bound humans below the warm comfort of their beds.

Oh, well, it hadn't always been as monotonous as this hop tonight. He had gotten a kick out of learning to fly under Vern Roberts. That was back in 1926, just after he left the University of Minnesota. He soloed in May of that year and, along with his pilot's

This is the speedy Lockheed "Electra" flown on Northwest Airways by Mal Freeburg. This is one of the fastest transports now in service and one that requires the strict attention of an experienced airline pilot.

Mal Bryan Freeburg, who has repeatedly shown his ability as a pilot in many airway incidents and accidents. He has "set 'em down" in all conditions and under difficult situations.

license, got the idea that he was pretty good. Just plain, everyday flying was no fun so he spent the remainder of that year and all of 1927 giving exhibitions and teaching folks not to wrap their arms and legs around the stick while in a spin.

Beep-beep-beep-beep . . . He suddenly became conscious of the radio beam signal in his ears. That darned, monotonous whistle could sure get on a fellow's nerves, but he had to admit it made flying a snap. Why, back in Iowa in '28 when he was president, vice president and board of directors of Shenandoah's pride and joy—the Freeburg Flying Service — he'd thought nothing of flying thousand-mile charter hops by luck and a road map. Today, all you have to do is take-off, keep the radio going with its steady "beep" and then land.

The Freeburg Flying Service went the way of most 1928 flying services, but it was impossible to keep Mal out of flying. By the fall of that year he and talked himself into a job with Northwest Airlines where he has been ever since.

Suddenly he tensed and his past was blotted from his thoughts. He spotted a fire on the black ground below. Boy, it sure was a beaut! Unconsciously he eased his taper-winged Waco into a long dive toward the flaming mass. The sudden realization that it was the high railroad trestle near Trevino, Wisconsin, that was ablaze sent him hedge-hopping back along the tracks wide open in search of the crack train which he had passed in the darkness just a few moments ago. He found it about a half mile from the trestle and had to zoom sharply to avoid hitting it.

The engineer was accustomed to seeing airplanes pass him overhead but this was the first time one had almost taken the stack off his locomotive. Mal Freeburg had to cut loose two perfectly good ground strafing dives before the engineer realized that this "flying fool" wasn't just flying by. Within 400 yards of the trestle he brought the train to a stop and not the least thankful of the many passengers was golfer Bobby Jones. No doubt they sent silent prayers of thanks winging after the lone mail pilot who was, by this time, pushing his ship a little harder to make up for the few moments he had lost.

Mal probably didn't receive Bobby Jones' prayer but he did get a check for $100 and a fine gold watch, the former from the *Chicago Daily News* for "performing the month's most heroic or

meritorious action in the pursuit of his routine duties" and the latter from the Chicago, Burlington and Quincy Railroad.

* * *

THE airways radio operator at St. Paul had just checked off the northbound ship with the usual, "all's well," and was idly studying the day's weather maps while waiting for the south-bound ship's regular report. He had heard from her just fifteen minutes ago and had chatted briefly with her pilot, Mal Freeburg. Mal still thought transport aviation was a pushover. He glanced back at his eight passengers who were either asleep or munching the remains of a light luncheon which had been served them a few minutes before.

Suddenly, the St. Paul operator got his report. Mal was on time all right, in fact he was way ahead of time. The "report" made the operator jam his earphones hard into his ears. God, he had heard right the first time, then. Freeburg was calmly repeating his message—"Freeburg speaking. Just broke starboard propeller. Flying near Wabasha."

Northwest officials blanched as they crowded around the perspiring operator. They were thinking of the eight passengers in Freeburg's trimotored Ford.

Once again the radio crackled. "Freeburg talking. Motor vibrating badly." That's all he said but that wasn't all that was happening. Eight staring passengers saw the unbalanced propeller shake the engine loose from its mounting, lodge in a wing strut and almost tear off the ship's landing-gear.

Freeburg went back on the air and described it to the operator and requested a relief ship to take his cargo on to Chicago! Lest the 500 pounds of dead weight drop and injure someone on the ground, he nursed his crippled plane toward the Mississippi River where, with several sharp jerks of his ailerons, he shook the engine loose and watched it fall 2,000 feet into the river below, leaving him with but two engines with which to keep his heavy ship in the air.

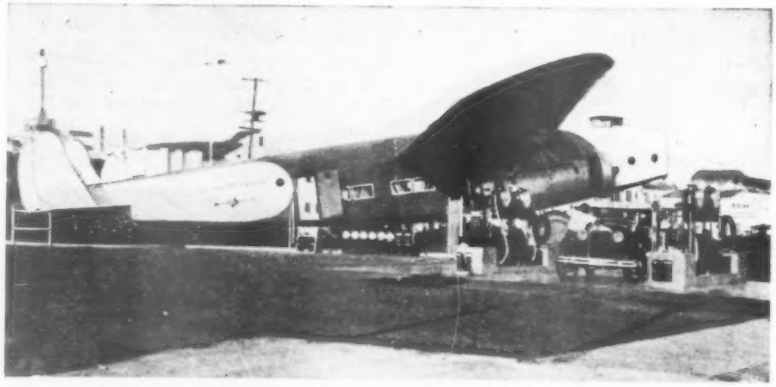
He coaxed the Ford to the nearest emergency field—25 miles from the scene of the mishap—cautiously approached the up-wind side of the airport, cut his switches and leveled off for a landing.

Almost stalling, they settled lower and lower. The landing-gear worried him, so he held the damaged wheel high, coming in for a one-wheel landing. The good wheel was now rolling over the field. Losing speed, the ship settled on both wheels. Freeburg braced himself for a ground loop and possible noseover. None came. He gently applied his brakes, they held, and the ship rolled to a stop, leaning heavily on the ruined wheel. The radio at St. Paul told the rest of the story—"Freeburg talking. Down safely. All's well."

He had not only saved his and his

(Concluded on page 54)

The Last Round-Up for the Fokker F-32's



Here is an F-32 Fokker employed as a filling station office in Los Angeles.

DO you remember the F-32's built by Anthony Fokker a few years ago? The largest of these four-motored transports now stands on a street corner in Los Angeles, California, as an advertisement for a gas station.

After 2,500 hours in the air, this 11¼-ton plane was discontinued from service because full pay-loads could not be obtained. The plane cost $200 an hour to fly.

The cores of the Pratt and Whitney Wasps have been removed and the propellers connected to electric motors, giving the plane the appearance of warming up for a flight. Aside from this, the plane is in flying condition.

Capt. Kingsford-Smith Lands in Hawaii

THE famous Australian flyer, Captain Charles Kingsford-Smith, completed his magnificent flight from the Fiji Islands to Hawaii. This famous long-distance flyer was delighted with the flight and with the performance of his Lockheed "Altair," named the "Lady Southern Cross."

This plane is a direct development of the Lockheed "Sirius," the improvements in the Altair consisting of a completely retractable landing-gear, split-type trailing edge wing flaps and a new type Wasp SE engine supercharged to deliver 500 h.p. at 11,000 feet. It is also provided with a controllable pitch propeller.

On the trans-Pacific flight, the Altair carried 630 gallons of gasoline which brought the gross load up to 8,250 pounds. The standard Altair is licensed for 5,800 pounds gross so that the Lady Southern Cross carried an overload of approximately 2,400 pounds. The gasoline is carried in large fuselage tanks, two 40-gallon tanks in the wings and a 25-gallon tank under the front seat.

To conserve fuel, Sir Charles kept the Wasp throttled down to 1,550 r.p.m. which gave the Altair an average airspeed of 146 m.p.h. as compared with the plane's proven 213 m.p.h. cruising speed at 17,000 feet. At the end of the long 3,197-mile trip from the Fiji Islands, the tanks still contained 50 gallons of gasoline when it landed at Honolulu. No trouble of any kind was experienced that threatened the safety of the ship.

It will be remembered that Sir Charles flew from San Francisco to Australia in 1928, and he is now considering the same flight but made in better time and with but two stops.

Capt. Kingsford-Smith's plane directly after its landing in Hawaii. It is a Lockheed "Altair."

Sopwith's Answer to the Fokker D-7

by GEORGE HURST

An interesting and yet amusing story of the Sopwith "Dolphin" and its enemy, the Fokker D-7, in which much data is given concerning the construction of both these famous wartime ships.

THEY mixed it up in 1918. On the ground, the Allies and Central Powers came to grips in the mud of No Man's Land. In the upper reaches, the heavens shook as the heavy drone of Mercedes motors blended with the higher crescendo of whirling Clergets and the blatant roar of Hispano Suiza's.

The airplane designers were moving their knights quickly on the chessboard of the sky . . . and each move meant life or death, victory or defeat. Performance figures were moving up. Speed was increased, climb was bettered and the ceiling raised. Maneuverability was improved, or was compensated for by increased structural strength, so as to enable the ship to hold its wings in long drops.

But enough of this. Suppose we go behind the scenes and take a look for ourselves.

Somewhere in Hunland, a fighter was being prepared for the ring. The corner was a 'drome back of the lines and the ring was thousands of feet in the air where both the Jerries and Doughboys could watch it battle to the finish.

It was 1918 and the Iron Cross needed an eagle that could go upstairs and dish it out as well as take it. Tony Fokker gave it to them when he developed the Fokker D-7.

It was a queer looking pursuit plane. The fuselage, which faintly suggested a pine box used for the canning of cadavers, was 22' 11½" long. The wings, which were internally braced and of thick section, had an overall span of 29' 3½". Upper chord was 5' 2½" and the lower, considerably narrower, 3' 11¼". The gap was 4' 2". It stood 9' 2½" high.

And here we have the Sopwith "Dolphin," powered with a 200 h.p. Hisso, one of the finest of the British wartime planes. It was particularly designed for high altitude work.

Both airfoils were in one solid piece with no inter-panel brace wires and were connected with single bay "N" struts. All of the controls, elevators, ailerons and rudder were of the balanced type. The upper wing, only, had ailerons.

The radiator was mounted in front of the motor with the gas tank behind. The motor was fixed and of the Mercedes type. The axle was streamlined in with an airfoil which must have developed quite a considerable amount of lift as the wheels reduced end spill to a minimum. On the cowling, in front of the pilot, was mounted two synchronized Spandau machine guns.

The D-7 was one of the most maneuverable, if not the most maneuverable ship, produced by the Bosches for the Grand Fracas. It was built solidly and was noted for its diving ability. I have heard it whispered that the safety-factor was a good eighteen. However, I won't do battle if you wish to disagree and make it sixteen.

Safety-factor is a "moot point" when you discuss planes used in the war. A factory rating and the actual safety-factor after the ship was constructed might be totally different. I will explain the why's and wherefore's later on.

The French government ran tests on a captured D-7, but I would like to explain these figures before I proceed further. Motors manufactured, either by the Allies or Central Powers, did not always develop their rated horsepower. Sometimes more, sometimes less. The propellers were not equally efficient and the ships themselves, due to the stress of wartime construction, could not help but **vary.**

Also, the Central Powers were forced to use a poorer grade of material during the latter part of the war. So remember, do not take these performance figures as final. One Fokker D-7 performed this way, maybe another did much better or another not quite so good. They should give you a pretty fair gauge as the dope was gathered from an actual test, however.

After four minutes and fifteen seconds of climbing, she leveled off at 3,281 feet. The speed, 116.6 m.p.h. It reached 6,562 feet in eight minutes and eighteen seconds and clipped along at 114.1 m.p.h. In thirteen minutes and forty-nine seconds it was up to 9,843 feet. The speed up there was 109.7 m.p.h.

It climbed to 13,124 feet in twenty-two minutes and forty-eight seconds

This is the Fokker D-7, not a beautiful ship but one that was chock-full of performance, much to the Allies' dismay.

XUM

and did 103.5 m.p.h. The speed was down to 94.9 m.p.h. when it reached 16,405 feet after thirty-eight minutes and five seconds of climbing.

The first models had the 160 h.p. motor installed and the later models, the 180 h.p. So, with increased horsepower, a better performance figure can be expected. A few, no doubt, had the big 220 h.p. Mercedes installed.

Performance figures tell quite a bit but they leave out some very important details and not the least of these details are maneuverability and diving ability. The D-7 had both and it was a mean scrapper.

The British had their ideas of what a pursuit plane should be, too, and late in 1917 and all through 1918, German flyers encountered exceptionally wicked looking biplanes produced by the Sopwith Aviation Company known as the "Dolphins."

The appearance of the "Dolphin" was quite different from previous Sopwith models. It was the only pursuit ship of this line that was fitted with a stationary water-cooled motor. This was in marked contrast to the Pup, Triplane and Camel that were built around a whirling steel nose.

The Hispano Suiza that was installed had a 200 h.p. rating and was geared to swing the propeller counter to the motor's revolutions. The result of gearing the airscrew in this manner was a decided tendency for the ship to spin to the left. The 220 h.p. Hisso was also used but I will confine my remarks to the former.

The wings had a span of 32′ 6″, were back-staggered and had double-bay struts. The chord was 4′ 6″ and the gap 4′ 3″. The overall length of the pouter-pigeon body was 22′ 3″. The maximum height 8′ 6″.

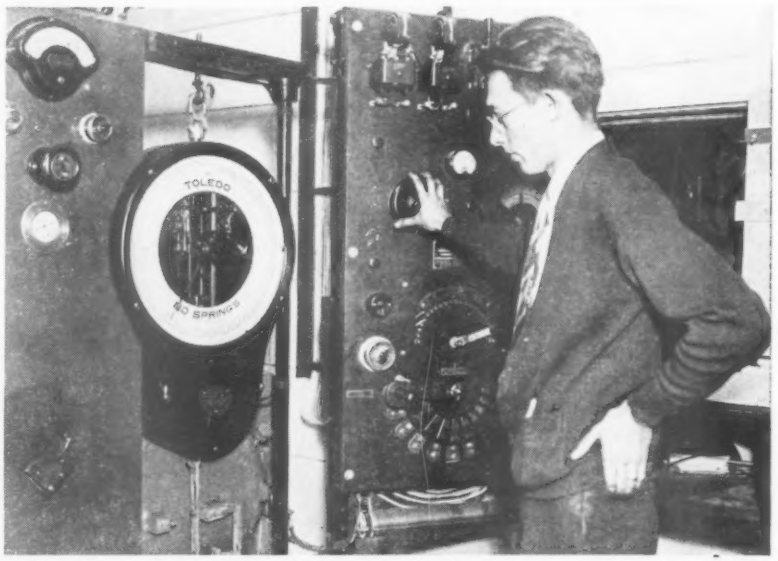
The pit was located directly below and between the front and rear spars and the pilot's head protruded through the cut-out center-section, making it quite delightful if the ship turned turtle when landing or taking-off.

The gasoline tank contained enough petrol for two hours and fifteen minutes of flying or 27 gallons, and was situated to the back of the cockpit. This was particularly bad in case of an accident as the pilot was sandwiched between a hot motor and the tank. The pit, as in the case of the S.E.5, was cramped and uncomfortable.

The Dolphin was constructed for stability and flying safety (in sharp contrast to the Sopwith Camel) with a corresponding loss in maneuverability. Twin Lewis guns were mounted on the center-section at a 45 degree angle and twin Vickers were fixed on the cowl and synchronized to fire through the propeller arc.

The Dolphin made the 5,000-foot level in five minutes and 10,000 feet in twelve minutes. At 10,000 it was capable of a top speed of 121.5 m.p.h. It weighed 1,959 lbs. fully loaded. Built for high altitude work, she was quite frequently put on trench flying duty during the latter part of the war.

Socony-Vacuum Oil Announces New Process



A Socony-Vacuum Engineer reading the gauges that tell him how the new oil is standing up under a test on an airplane engine.

A NEW and revolutionary way of refining oil that is expected to revolutionize the entire trend of present-day refining and save millions of dollars for motorists and airplane owners has been announced by the executive committee of the Socony-Vacuum Oil Company, Inc.

This is known as the Clearosol Process which is considered by many as one of the greatest advances in lubricating oil refining in the history of the oil industry. This new method employs powerful solvents to wash the impurities out of the oil, producing all of the desirable characteristics of a lubricating oil in a single operation. It minimizes carbon in the engine cylinders and eliminates tar, gum, and sludge to a degree hitherto thought impossible.

Development of the new oil was hastened by the great increase in automobile performance during the past few years. The speed of automobiles has increased tremendously. Engines now run at 4,000 r.p.m., piston speeds average 3,100 feet per minute, flame velocities in the exhaust ports reach 100 m.p.h. and valve stems reach a temperature of 700 degrees Fahrenheit. The demands are ultimately more difficult to handle than with the modern aviation engine. Again, the oil must preserve its fluidity at low winter temperatures.

Formerly, it was customary to refine oils with sulphuric acid or clay, both of which had decided objections. Again, the refiner was previously limited by the nature of the various crude oils as well as by the refining methods for no single crude possessed all of the desired characteristics and no refining process could correct the shortcomings of the various crudes. By the Clearosol Process, sulphuric acid is eliminated and it is as simple as washing sugar out of sand. Pouring water on this mixture dissolves out the sugar by a purely physical operation and this is exactly what happens in the new process.

Solvents in the new process work in two ways. One type precipitates the carbon-forming material from the oil. The other type solvent removes substances that are unstable at high temperatures and which have a high degree of viscosity variation. Together, the solvents form an almost ideal refining operation. The new oil lasts 25 percent longer and there is an absence of stuck piston rings, gummed valves and other dangerous or annoying features. And—the new oil will cost less than the old type oil.

A New Russian Giant Projected for 1935

SOVIET RUSSIA, the land of big things which includes the mammoth "Maxim Gorki" transport plane, is now considering the advisability of going into still larger aeronautic projects.

We are advised that the new plane, now under advisement, will make the huge Maxim Gorki look like the proverbial mosquito for it is to have a wing span of more than 200 feet and is to be provided with 15,000 h.p. in engines. Just how many engines will be required for this output is not stated, but even though engines of 2,500 h.p. each are installed, it will take six of these units! If 1,000 h.p. engines are employed, there will be fifteen of them along the entering edge of the wings.

It is certain that this ship is to be used for government purposes. A few hours flight would surely create a gasoline shortage in any ordinary town.

The Coast Guard's Air-Force

by LIEUT. H. LATANE LEWIS, II

The United States Coast Guard is a hard working department of our government, performing a multitude of tasks. In this article, the author sets forth many interesting incidents in the battles between the Coast Guard and the smugglers.

THE business of keeping contraband from the sky trails across our borders has recently been taken over by the United States Coast Guard—that veteran guardian of life and law upon the high seas.

The necessity for maintaining an air patrol became keenly apparent during the days of national prohibition. Aircraft furnished the outlaw with the quickest means of illegal entry and the one that was least apt to be apprehended. Great quantities of liquor and alcohol were flown into the United States, some of it from neighboring islands and some from ships which had come considerable distances to be met by aircraft off-shore. Now, the traffic has turned chiefly to narcotics and aliens.

Usually, the outlaw plane that crosses the border is met by another plane at some isolated point and the contraband transferred, to be flown deep into the interior. The government has found that ground forces are inefficient in detecting and combatting this traffic. The only way to fight aircraft is with aircraft. Moreover, planes can scout wide areas at sea and maintain a close vigilance upon suspicious hovering vessels.

For some time, the work has been done by a small Air Patrol of the Bureau of Customs, using for the most part planes that had been confiscated from smugglers. Although some of the equipment was thoroughly obsolete, the little band of pilots who flew under the Customs' insignia performed with dauntless courage the hazardous work of attacking desperadoes in the air.

A few months ago, however, the job was put on a real military basis. The Coast Guard assumed the role of border policemen and most of the planes previously used were scrapped. Four fast Vought observation planes were placed in service and six other ships, seaplanes of various types, were also assigned. All of the pilots are regular officers of the Coast Guard who have graduated from the Navy flight-training school at Pensacola with the designation of Naval Aviator.

The radio room of the "Dolphin" by which the crew is kept in touch with the shore stations.

This is the "Dolphin," a General Aviation ampibian much used by the U.S. Coast Guard. These planes must be rugged to withstand service in all sorts of weather.

The assignment of this work to the Coast Guard has resulted in considerable economy as the planes may perform other duties besides chasing criminals—duties that have previously kept Coast Guard aircraft in the air in addition to the patrolling planes of the Customs Bureau. This consolidation of effort will cut down expenditures to a marked degree.

While flying a regular "police beat," the Guardsman may receive a radio message to pick up a seriously injured person from a ship at sea; to rescue the occupants of a small boat in distress; to assist other aircraft; or to perform countless other tasks for which only the Coast Guard is equipped.

Moreover, the interests of national defense are being served, for it is giving training to qualified Naval Aviators. In time of war, the Coast Guard automatically becomes a part of the Navy.

Air Patrol Detachments are maintained at San Diego, San Antonio, and Miami. In addition, it is proposed to establish stations at St. Petersburg, Florida, and Biloxi, Mississippi. At the latter station, the detachment will cover the Mississippi delta region where the bayous and other protected water form a haven for the smuggler.

The real focal point of smuggling activity in the United States is a stretch of beach about 100 miles long on the coast of Florida. Smugglers radiating from the Bahama Islands usually land somewhere in this area. However, it is a veritable game of hide and seek to catch them.

They operate into a number of isolated fields and lakes, with which this country abounds, and when they find that one place is "hot," or being watched, they drop in on another. Signals from ground accomplices, such as a group of men in white shirts forming a triangle, warn them of the danger of capture. Modern criminals provide themselves with the latest equipment and make use of every new invention to carry on their illicit practices.

The outlaw flyer employs many clever wiles and dodges to throw police planes off the track. It is only by constant and vigorous pursuit of every suspicious aircraft that this traffic can be controlled.

While Coast Guard planes on patrol duty are heavily armed, the catch is that they have no authority to fire on outlaw aircraft. Making a capture calls for considerable ingenuity. By careful maneuvering, a hostile plane may be forced down but here again if the occupants are killed or injured, the Coast Guard pilot may find himself facing criminal charges.

Frequently, the Guardsman will fly so close that he can look into the cockpit, or through the cabin windows, and see the contraband. But until he has the authority to put a few bullets near the outlaw, he is greatly handicapped.

Some of the jobs that the Guardsmen perform as they go about their duty of patrolling the skies along the border are intensely dramatic. In emergencies, when a life hangs in the balance and minutes mean the difference between recovery and death, the Coast Guard flyer leaves his beat, goes to the rescue, often at great risk to his own life.

Recently the report was received at the Miami air station that four college girls were lost on Biscayne Bay in a small sailboat. They had started for a

short cruise the day before and had not been seen since.

The east was turning grey as the flying boat *Arcturus* slid down the runway into the water. It would soon be light enough to see and Lieutenant C. B. Olson, an old hand at the grim business of snatching human life from the sea, gunned his twin *Wasp* engines and lifted the big ship into the air. Over the blue waters of Biscayne Bay, the flyer's keen eyes searched unceasingly for a sight of the missing craft.

Stranded on a jagged reef near Shoal Point, where a stiff breeze had swept them, the four girls huddled in the bottom of the boat. Throughout the night waves had broken over them, soaking their clothing, and a chilling wind had numbed them. They had had neither food nor drink. And to make their misery complete, they had been chewed up by swarms of mosquitoes.

In the stillness of dawn, they heard a distant hum. Perhaps they thought for a moment it was only the mosquitoes but then they caught sight of a tiny speck against the leaden sky. As it grew larger, it took on the form of an airplane. It was an anxious moment for the girls, for they feared that the pilot might not see them or do nothing about it if he did. However, when the big yellow wings dipped as the plane circled overhead, they could clearly read "U.S. Coast Guard" painted on the fuselage and realized that here at last was help.

Olson dropped the plane into the water and took the girls aboard. They were suffering badly from exposure and he raced back to the air station at high speed. Parents of the missing foursome, who had been waiting anxiously and clinging to the scant hope of rescue, heaved a sigh of relief when Olson delivered his precious cargo.

It was just a routine flight for the plucky Coast Guard flyer, and his terse report to headquarters treats it as simply a commonplace incident.

Somewhere upon the seven seas is a sailor who, whenever he beholds the light of day, can thank Olson for saving his eyesight. The man had a piece of steel lodged in his right eye. If it had not been immediately removed, it would have caused total blindness, but at Key West, where the accident occurred, there were no facilities for such an operation.

People along the coast have a habit of calling upon the Coast Guard in every emergency and a plea was made to air station officers at Miami. Immediately Olson flew to Key West, where he was met off shore by a motor launch and the patient transferred to the plane. A short time later the man was on the operating table in a Miami hospital. The swiftness with which Olson responded to this call for help resulted in the saving of both eyes of the seaman.

On another occasion Olson removed

(Concluded on page 58)

Perils of Film Transfers

Four consecutive views of the accident and the rescue. The second photo shows the plane striking the water.

THESE most remarkable pictures were taken from the deck of the steamship Washington when that vessel was about 650 miles off of Cape Race, Newfoundland.

The Washington was carrying the precious films showing the assassination of King Alexander of Jugoslavia, and the Fox Movietone News, seeking the ever-desirable scoop, had flown a Sikorsky seaplane to meet the Washington and take the films for a fast flight back to New York. The meeting took place but with consequences fatal to one of the occupants of the seaplane.

First, and at the top, we see the seaplane circling over the Washington, preparatory to making the fatal landing on the water. Next, we see the plane striking the water at a steep angle with a terrific crash. The plane sends up a high spray of water after striking and then turns over. The third photograph shows that the crash was too much for the structure for it is now beginning to settle to the bottom.

The five men were momentarily trapped in the plane, but finally clambered out on the tail and, but with one exception, clung there until a rescue party from the Washington reached them. The man who was drowned was "Happy" Johnson, a mechanic.

How They Ground 'Em in Washington

WASHINGTON State's motorcycle-pushing "aeronautical officer," George E. Fisher, has just reported to chief motorcycle-pusher William Cole the glad fact that hunting has been good in the private-flyer covey.

In the past six months, aeronautical expert George has nailed no less than twenty ships to the ground. His reasons: "They were not airworthy or lacked proper federal licenses."

To many observers it is not quite clear how motorcycle-rider George can cock his weather eye at a ship and tell whether or not said ship is airworthy; but George's average is good, anyway, since he inspected a total of seventy-five ships.

Eleven of the plane owners, who were grounded, have knuckled under and have "complied with regulations." They, by the grace of the governor of the state, are now allowed to use Washington's air once more. The other nine unfortunates have not yet bowed their heads and several are remarking very loudly that they don't intend to.

Some plan to leave the state. Others, unable to leave, will have to spend their time in hangar flying, maybe dreaming about a distant land where motorcycle patrolmen can't tell airmen when and how to fly . . . . and in what.

One of the paragraphs in the report that George, the boy wonder, sent to his chief has been arousing a lot of chuckles among the state's flyers. It seems that a pilot was arrested for flying while drunk and fined one hundred dollars for said offense.

"How did George do it?" the boys are asking. Did he ride along under the flyer on his motorcycle until the plane ran out of gas, or what? Shades of the good old days, when certain very famous flyers insisted they couldn't do their stuff until they were too drunk to walk!

Glide with Speed Westphal

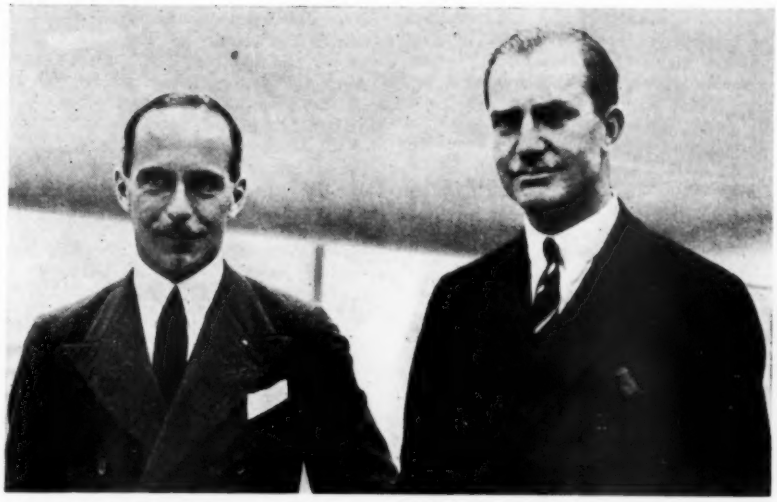
SPEED WESTPHAL, one of the best known glider experts in the Middle-West, is endeavoring to re-establish interest in gliding. He had a message for you in the last issue and is again paging all young fellows who wish to glide but who lack sufficient funds to get a glider of their own.

So much interest has been displayed in Mr. Westphal's project that he informs us of five new clubs that he has started since the publication of his article. He believes, and so do we, that there are lots of boys still interested in gliding but who, so far, have been unable to find a way of getting into the sport.

If you wish to get into a club and if you live near Chicago, write him in care of POPULAR AVIATION, 608 South Dearborn St., Chicago, Ill. Mr. Westphal contributes his services gratis to the clubs, for gliding is his hobby and he takes great pleasure in starting gliding clubs.

A deHavilland "Comet" Wins Race

by
F. HOWARD SCHMIDT



T. Campbell Black (left) and C. W. A. Scott, pilots of the winning deHavilland "Comet."

THE latest air sensation, perhaps the most talked-of airplane in the world at this moment, is the famous creation of England's famous deHavilland Company—the "Comet."

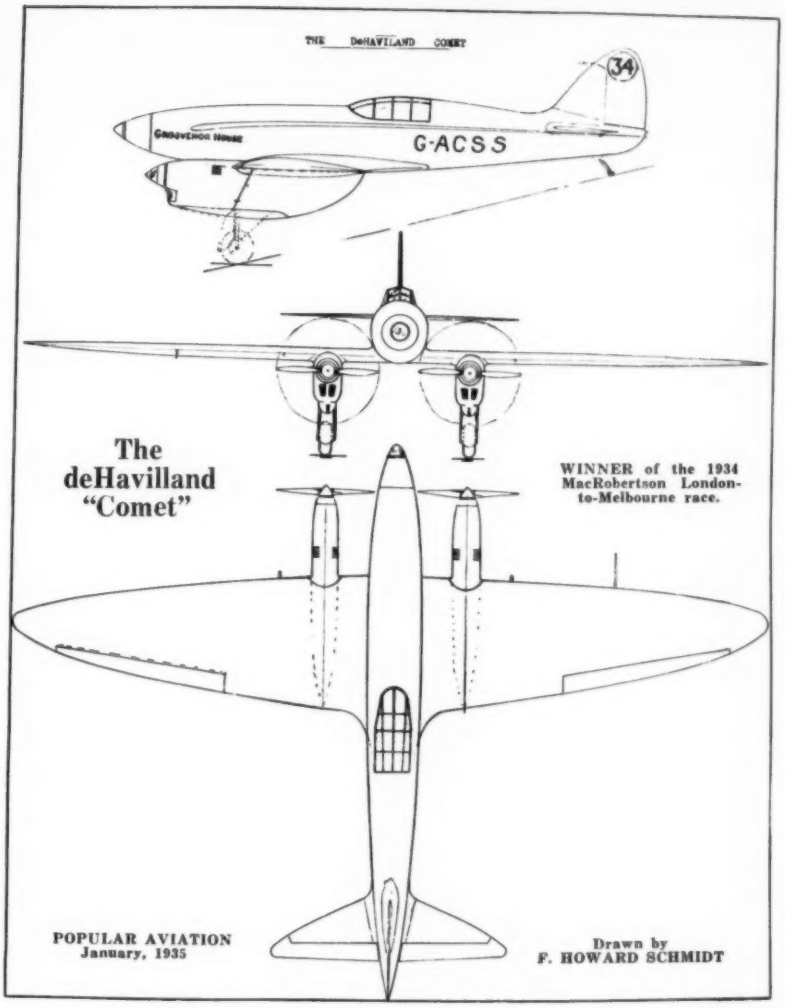
There have been three Comets built to date and all of them were entered in the recent London-Melbourne Classic. The Comet flown by the two intrepid Britishers, Campbell Black and C. W. A. Scott took first honors when they roared into Melbourne after covering the 13,000-mile hop at an average speed of 170 m.p.h. Another Comet placed fifth in the race. The third deHavilland Comet was piloted by the renowned flying couple, Amy and Capt. James Mollison, and placed fourth among the leaders.

The sleek Comets are powered with two neatly faired deHavilland engines. These engines have six cylinders each, and are the latest thing in light in-line air-cooled motors, having been redesigned from an earlier series specially for this plane. Propellers are of the metal controllable-pitch type, each having two blades. They were built by Hamilton in this country. The engines are placed in beds attached directly to the huge single spar that supports the wing. This spar is built up from laminated plywood, tapered in shape and its upper and lower surfaces form a part of the outer wing covering which is also of plywood.

Monocoque in construction, the smoothly streamlined fuselage of the Comet planes is made entirely of plywood run in long gores along the length. In the fuselage are located three independent fuel tanks and behind these, in a single small cabin, are housed both pilots. The persons flying the plane can alternate in control as the Comets are equipped to the hilt with dual controls, for both engine and ship.

The planes have complete navigating equipment as is to be expected in a ship designed primarily for distance flying. A single landing-light, centrally placed, is to be found in the nose of the Black-Scott ship. The lense of this light is cast in the eliptical form and carries out the smooth nose contour of the plane, in an unbroken streamline.

The landing-gear is retractable and on their closing, carry a fairing plate which completely covers and rounds out the wheel in one smooth surface. Ex-



haust from both engines is disposed of through six short pipes which protrude a fraction of an inch below the engine cowling.

The workmanship is unusually fine. The nacelles and cowls are fine examples of the sheet-metal worker's art, perfectly smooth and with full flowing fillets. Many have exclaimed that the covering, both for the fuselage and the wings, was by far the best job at the races.

And now for a few words about the race itself. Charles William Anderson Scott and Thomas Campbell Black, in a DeHavilland Comet crossed the finishing line at Melbourne at 15.34 hours, thus winning the $50,000 and the gold trophy put up by Sir MacPherson Robertson. They had covered 11,300 miles in 70 hours, 59 minutes, 63 hours, 55 minutes of which had been spent in the air. The average flying speed works out at 176.8 m.p.h. and for the total elapsed time, 160 m.p.h.

Now, one of the important points in the race was the "handicap" or compensating speed formula which is devised to favor efficient airplanes carrying useful payloads. The payload in the formula is defined as 200 pounds for each member of the crew, with baggage, spare parts or ballast, but not fuel or oil. The formula becomes:

$$V = 140 \left(1 - \frac{0.2L}{W\text{-}L}\right) \left(\frac{P}{A}\right) 0.33$$

Where: V = Airspeed in m.p.h., equated.
W = Total weight in pounds.
L = Payload in pounds.
P = Maximum power at normal r.p.m. at sea-level.
A = Area of main planes in square feet.

This "handicap" formula gives the K.L.M. Douglas, which has been cruising at 180 m.p.h., a handicap speed of only 168 m.p.h. The total distance for the handicapped course is 12,314 miles although the actual distance as flown by the winners was 11,300 m.p.h. The speed (V) obtained by the formula is then divided into 12,314 to obtain the equated flying time.

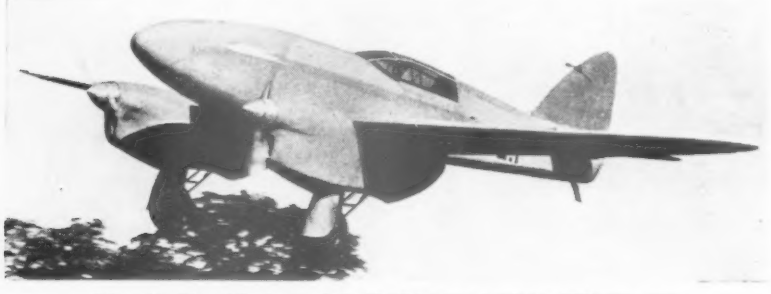
This sort of formula has been tried out in tests of transport and long distance planes before, but the results are usually open to some question in the final analysis, and so it seems to be the case here. The most interest attaches to the men and ship that actually cross the line first and no amount of mathematical winners interest the general public. Altogether there were three Comets in the race. The first was the winning Comet flown by Scott and Black. The second Comet was flown by Jones and Walter, this plane taking fourth place. The third Comet was that flown by Capt. James A. and Amy Johnson Mollison, which fell out of the race at Allahabad. This ship maintained a high speed up to the time of the landing-gear trouble and it broke the record from England to India. All of the contestants experienced bad weather and in many cases much time was lost from this cause.

The American planes showed up very well in spite of the fact that two of them were stock transport planes. The K.L.M. Douglas, flown by K. D. Parmentier, J. J. Moll and C. Van Brugge, were second to Allahabad, Singapore, Darwin, Charleville and Melbourne. They were forced down by a thunderstorm at Albury and took off the following morning. At least eighteen stops were made along the way and most of them at regular ports of call for the K.L.M. airliners. As a matter of fact, this ship was really flying a scheduled air-route.

Col. Roscoe Turner and Clyde Pangborn, flying a Boeing 247 standard transport plane, were third. They made ten stops along the way and lost about five hours by overshooting Allahabad. They were off their course at this time by about 200 miles, but put up a good showing at the finish, nevertheless. Again, they were forced to make a landing at Bourke, 400 miles from Melbourne, to inspect the lubricating system. They were on the ground 11 hours, 30 minutes during stops.

America was also represented by the three Whirlwind engines on the "Pander" S4, flown by D. J. Asjes and C. J. Geysendorffer. Unfortunately, this Dutch ship was out of the race at Allahabad.

But what strikes us as most amazing, is the flying of the K.L.M. Douglas which was carrying three passengers, baggage, food and 30,000 letters, making regular stops along the airway. This was consistent flying that rather put the other contestants in a dubious light. True, one Comet came in first, but then a second Comet came in a poor fourth and the third was forced out of the race altogether.



This is the "Comet," winner of the MacRobertson London-to-Melbourne race.

Water-Wings for the Navy

Experimental demonstration of the floats.

WATER-WINGS, for landplanes that may be forced down on water, have been developed and tested by army air corps engineers at Wright Field, Dayton.

Buoyancy is attained instantaneously by the automatic inflation of two rubberized bags concealed in traps in the upper wings. Liquid carbon dioxide gas is released from a cylinder in the cockpit, through a tube to the bags. With release, it converts into carbon dioxide gas, expanding 500 times its volume as a liquid.

The cylinder is within reach of the pilot, and may be manually operated. But tests have shown the efficiency of the automatic system, so that if the pilot is disabled or thrown out, the bags would inflate anyway.

With the first rush of gas the bags are partially inflated, forcing open the traps and permitting the bags to drop below the wings. When fully inflated the bags will float the craft for an indefinite period.

The automatic feature of the system depends on alternate tubes, one leading to the landing-gear, the other to the top of a wing. These tubes are open and coiled at one end, the other end leading to a sensitive diaphragm valve at the cylinder head.

Pressure in either tube caused by filling the coiled end with water is sufficient to release the valve. The upper tube would function should the plane land upside down.

Airport Lighting Methods

AIRPORT lighting is always an expense and somewhat of a problem to the airport manager. First comes the investment in the lighting equipment, wiring, underground cables, excavations, lighting stands and all the rest of it. Second comes the steady grind of electricity and maintenance.

A number of attempts are now being made to simplify this problem. One well thought out scheme uses battery operated neon lamps for the border lights, etc. Another stunt, now in its experimental stages, uses phosphorescent screens for lights that are activated from ultra-violet rays sent out from the central airport building or from small underground huts along the way.

More Speed on the Airlines!

by E. STANTON BROWN

The intense rivalry and competition between the various airlines has led to the present tremendously high speeds on the American airlines. Whether higher speeds will be necessary to meet further demands by a speed-mad public remains to be seen.

SPEED! Speed! Give us more speed! From every air traffic man's throat the cry went up. Speed to sell. Speed to make air travel more advantageous and necessary to the American business man. Speed to compete with other airlines.

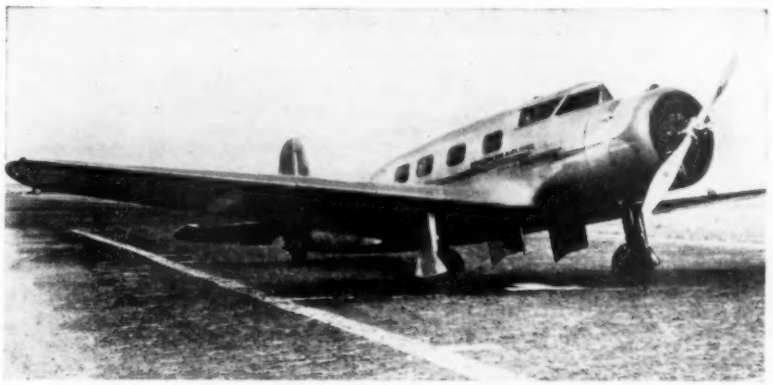
Slide rules gleamed whitely. Eyes strained over mathematical formulae. Backs bent over drawing tables. Models tugged at sensitive balance arms in the blasts of roaring wind tunnels. The click and clang of tools and the scream of metal being worked into shape rang through factory fabrication and assembly rooms.

Slowly the dreams of designers took form under skilled fingers. Tests on the ground to destruction. Flying tests. At last the final O.K. One by one the new ships lift their tails, then their noses and cleave the free-flowing air of the skylanes.

Schedules reduced. More comfort. The flying public flocks to try the newest in air transportation.

Fascinating business, this, to create something better than that which has gone before. Fascinating also, to closely observe the endless struggle in America for air supremacy, to note changes wrought by that struggle, to watch the rhythmic rise and fall of airline supremacy, to follow the trend in the air.

When, in April, 1933, United Air Lines flung the Boeing 247 on their routes, they had the air transportation world by the tail. There was nothing like the 247 on any other line to compete for speed, comfort and graceful streamlined appearance that suggested the very essence of air transportation, swift flight, strength and safety.

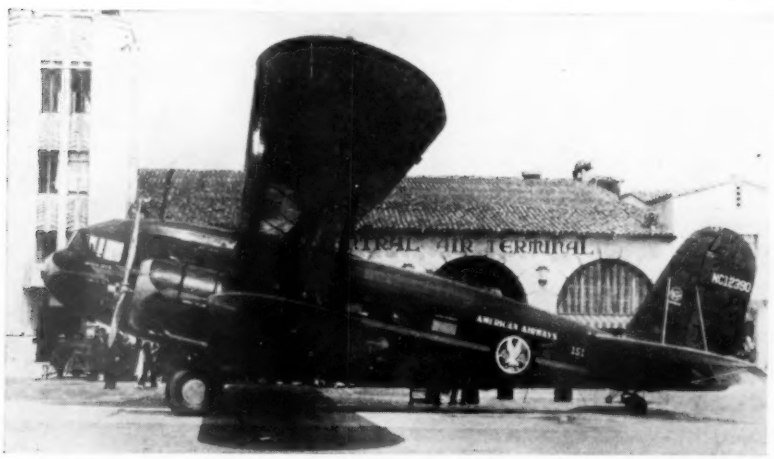


A "Vultee" low-wing monoplane of the ultra-high-speed class in use on the American airways. It is said to be the fastest transport plane in the world.

For over a year United reigned supreme. Then in spring and summer of 1934, the race of equipment began in deadly earnest. American Air Lines and TWA first took up the challenge United had flung at them.

First, what is without doubt one of the greatest forward steps in air transportation—the sleeper plane. In March, 1934, American Air Lines began operation of the Curtiss-Wright "Condor" sleeper plane between Dallas and Los Angeles. No more half-sitting, half-reclining, fully clothed throughout the night, dozing intermittently and awakening with a stiff neck and cramped muscles. Now one could fly at 150 m.p.h. resting comfortably in a berth, in pajamas and in a cabin as quiet as a Pullman car.

June first saw TWA courageously begin operations with the new Douglas between Chicago and New York without a mail contract, depending solely upon the passenger and express revenue to pay the plane's way. One ship a day at first, flying the 725 miles in four hours and twenty-five minutes against United's four hours and fifty-five minutes and American Air Lines' five hours and fifty-six minutes with Condors on a 786-mile route between the two cities.



A "Condor" biplane "sleeper" used on the American Air Lines, the latest development in comfort on long distance flights.

The finer equipment won. Swifter schedules, the larger and more commodious Douglas made a deep impression upon the flying public. Soon two Douglases were flying between Chicago and New York daily. Then three and then four. United Air Lines had been struck a hard blow. Starting the summer season with an ambitious and laudable schedule of thirteen round trips daily between Chicago and New York, and the slogan "Every Hour on the Hour" during daylight hours, United was soon forced to reduce the number of trips. One could not help but notice that every time TWA put a new Douglas trip on, a United Air Lines trip was soon discontinued.

American Air Lines still further increased the keen competition, when, in July, 1934, they put a Condor sleeper plane on the Chicago-New York run, offering, in the opinion of the writer, the finest service between the two cities for the hurried business man. Leaving Chicago at 11:05 P. M., he can now rest comfortably all night and awaken at 6:00 A. M. refreshed and ready for the business day, in New York. If he wishes, he may board the plane an hour before departure and remain aboard an hour after landing. It is not necessary now to lose any portion of a business day or one's rest.

Eloquent testimony to the need for

XUM

such a plane, and its popularity, is given in the statistics of the number of passengers it has carried. Since March, 1934, when the ships were put on the Dallas-Los Angeles route, and since July, 1934, when they went into operation on the Chicago-New York route, to November first, 1934, more than four thousand revenue passengers have flown in it on the two routes.

United Air Lines, once king of the airlines, has continued taking it on the chin during the summer and fall. Northwest Air Lines, flying the faster Lockheed "Electra" from Chicago to Seattle over a shorter and more direct route and offering a lower fare, has cut in heavily on the North Pacific Coast business. TWA, with overnight service from New York to Los Angeles, via Chicago, is taking its full share of the South Pacific Coast business with the Douglas.

Northwest Air Lines, flying in competition with Hanford Air Lines between Chicago and Fargo, North Dakota, which latter line has the mail contract for that route, and operates Ford Trimotors and Lockheed Vegas, has been cornering practically all of the passenger business with their Electras. Hanford carries little else besides the mail with their equipment which is 75 m.p.h. slower than Northwest's equipment.

American Air Lines, operating the Vultee, the fastest transport plane in the world, on the Chicago-Dallas-Fort Worth route, has driven two smaller competitors out of Chicago, Bowen Air Lines and Braniff Airways, both flying the tried-and-true, but out-of-date Lockheed Vega. The two latter lines are now operating routes which are non-competitive, or virtually so.

The race of equipment has been an exciting one and its benefits to air transportation and the industry in general are numerous. One says "has" been an exciting race because now a period of stabilization of equipment on the airlines is in sight; will be here, in fact, by the first of the year.

The airlines, for the most part, will have shot their bolts and a generally improved equipment condition will exist throughout the country. Their money is sunk in the new equipment, their financial condition at the present not as good as it should be, though sound, and will limit purchases of much new equipment for one or two years. United Air Lines will probably be the first to lead the way again, since their equipment, being older, will warrant replacement sooner than that of the other lines.

The Douglas, which Colonel Lindbergh said represented, with the Sikorsky Brazilian Clipper, the greatest forward stride that had been made in aviation at any one period of time, promises to be monarch of the air and will be in operation on four important lines.

American Air Lines, completing a $2,500,000 re-equipment program, will have the Douglas on its New York-Chicago, New York-Washington-Nashville-Memphis-Dallas and Chicago-Dallas routes. Condors and Vultees will replace the Fords and Stinson Model U's on other routes.

A Douglas plane operated by the Pan American-Grace Airways. This line also operates the well-known "Clipper ships" on its South American system.

Eastern Air Lines have the Douglas on their New York-Miami and Chicago-Jacksonville-Miami routes. General Air Lines is now flying it on their Salt Lake City-Los Angeles route and TWA will continue with the ship, opening up new schedules as more Douglases are received.

United Air Lines, by putting the Boeing 247-D on their routes, will rise almost to par, in the matter of speed, with the rest of the lines. The 247-D, an improved 247, with geared motors, three-bladed adjustable props and cleaned up motor cowling, has a top speed of 200 m.p.h., cruising at 189 m.p.h. at 12,000 feet and at 180 m.p.h. at 8,000 feet. Further insulation of the cabin, the less noisy three-bladed props on geared motors and an improved ventilating system, will make the ship as quiet as any in the air. New seats in the cabin will add to the comfort of the plane.

Pan American Airways, while not operating in competition with any of our domestic airlines, is strengthening its position against the encroachments of European airlines with the addition of Douglases and the Brazilian Clipper.

All in all, the equipment race has marked a period of healthy development, both in air transportation and in the industry. The mechanical benefits have been numerous. Speeds on the major airlines have increased from the neighborhood of 125 m.p.h. to those approaching 200 m.p.h. The most encouraging thing about the increases in speed is that they are due more to cleaning up of design and greater aerodynamic efficiency than to stuffing more power under the motor cowls. Improved structural practices have aided a great deal in the general speeding up of air transportation also. The all-metal airplane with stressed surfaces is being developed into a more practical and safer aircraft with the passing of each month.

Retractable landing-gears, wing flaps, adjustable pitch propellers and geared engines have appeared on transport aircraft as a direct result of the striving of each airline to gain an edge on its competitors. The direct gains to the air transport industry have been manifested in airplanes which are speedier, safer and more economical to operate.

With the new aircraft on our lines, operating costs have been pared down to the point where a passenger load factor of between 90 and 100 percent of available space would enable the lines to show a profit from this form of traffic alone, at present fares. At the present time, however, the highest mark reached is 57 percent of available passenger space sold.

In the matter of equipment, the airlines of America have still further strengthened their position as the finest in the world, bar none. The performance of the Douglas in the MacRobertson London-Melbourne race, was an unhappy revelation to European countries. The London Evening News was not backward in its indictment of British commercial aviation:

"It gives irrefutable tragic proof," said the Evening News, "that we are miles behind other countries in commercial air transport. The race was an ordinary trip for the Douglas. The efficiency of American engines and aircraft is such that at no point did it have to stay long on the ground. Only one Royal Air Force fighting plane is as fast as this flying train. Comparison with our civil aircraft is too degrading."

So much for the rosy side of the picture. There is yet another side which is not so pleasant. That side has to do with the airlines themselves, with their attitudes and practices toward each other and with the executives of the lines.

In the struggle for airline supremacy competition has not been merely a matter of equipment. It has also been a matter of getting the jump on the other fellow as often as possible, by fair or foul means, in an effort to snare his passengers. Instances in which one line has stolen another's passengers are too numerous to recount. It has always been, as it is in any competitive enterprise, "use my service rather than the other fellow's, and the devil may care how I get you to use it just as long as you do."

Now, aviation, air transportation in the whole, is too big and important a

(Concluded on page 51)

The Future of the Rotor Ship

by ALVIN EDWARD MOORE

Mr. Moore's connection with the Patent Office makes it a simple matter for him to gather accurate information on aircraft of original types. In this article, he gives useful data on the progress and development of the rotor plane.

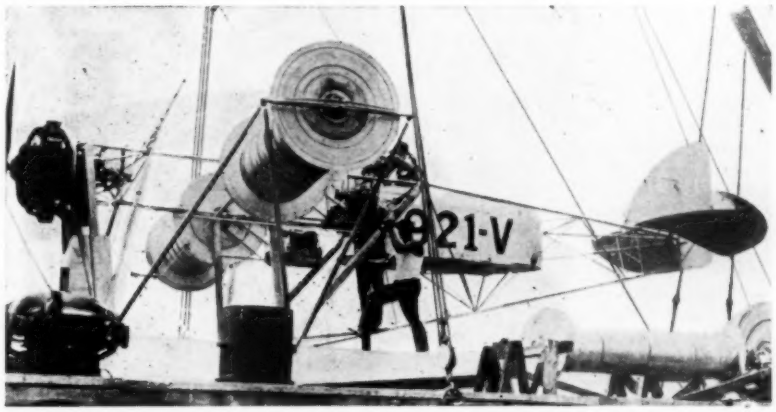
WHEN Anton Flettner sailed his rotor ship, the Baden-Baden, across the Atlantic ten years ago many imaginative men interested in aeronautics conceived the idea of substituting such rotors as furnished his propulsive power for the wings of an airplane.

But Flettner and they were not the first to have this idea. Before Flettner began his experimentations, a few pioneers had conceived it and since 1925, a few score men have secured patents of various structural adaptations of it and a great many more have given thought to the problem. Of these later pioneers, in 1930, one actually built and reputedly flew a mysterious experimental craft with rotors for wings.

Now, most inventors of this type, who work on the far frontiers of our mechanical civilization, do not learn very much from the lessons already mastered by their predecessors and contemporaries, for the simple reason that they have no centralizing research director and information service. The consequence is that they usually work in the dark or half-dark until some one of their number—who usually happens to have learned most of what has gone before—solves the basic problem.

In the hope that those inventive readers of this magazine who are working with the problem of the rotor aircraft may be given a short-cut, the following analysis of the rotor craft—its theory, difficulties, past history and future possibilities—is made.

Most of the readers of this article are familiar with the principle known as the Magnus effect. It is called by some the Flettner principle, but the Magnus effect is the better name as it was Professor Magnus who first discovered, in 1853, that rotating bodies, subjected to a fluid current, move in a direction perpendicular to the current.



Here is the mystery rotor ship of 1930 that was given secret trials of which nothing was divulged.

An army officer had also noted that rotating shells tend to move out of their direct course and Professor Magnus was commissioned to ascertain why this happened. After some study Magnus described to the world the Magnus effect.

This effect is caused by the following phenomena. When a cylinder (or sphere) revolves, a layer of air next it adheres to its surface—due to the greater friction between the surface and the air than between the molecules of the air—and revolves as fast as the surface. Farther out from the surface, other layers revolve more slowly until finally there is a layer which is not disturbed by the cylinder.

Now, if this cylindrical layer, which revolves, meets a current of air on one side of the cylinder, its revolution is opposed by the current and on the other side it is aided. On the side where the layer and the current go in opposite directions, a pressure is built up and on the other side a partial vacuum is created.

Thus, the effect is similar to that of an airplane wing whose camber or curve in an air current produces a partial vacuum on top and a pressure beneath, but its moving force is much stronger than that of the wing due to the rotation of the layer of air.

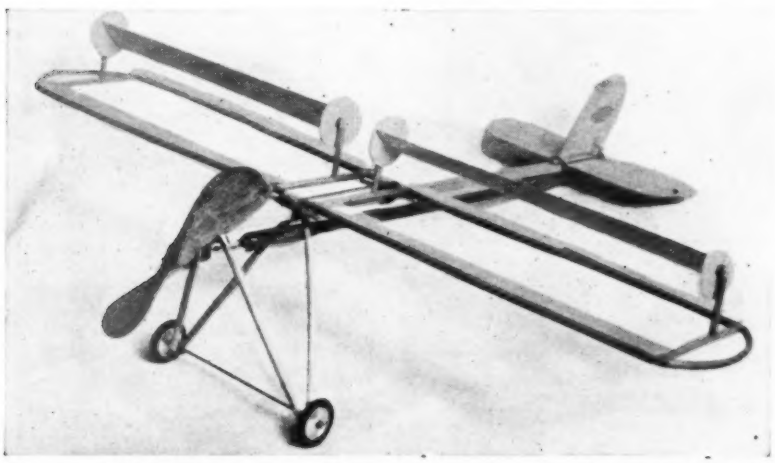
And so, if we substituted rotating cylinders for the wings of an airplane, they theoretically would lift much more than stationary wings of a much larger air-exposed surface. This would make for compactness, shorter take-off and landing, and the ability to control within limits the lifting force by variation of the speed of the rotors. Here we have the theory of the rotor aircraft. It is perfectly sound.

The question we should answer, however, before designing and building such a craft is: do the theoretical advantages of the rotorcraft outweigh its disadvantages when compared with other forms of aircraft?

The basic qualities needed by an aircraft are:

(1) Safety, which includes the impossibility of stalling in air and the ability to land with a short run or no run at all.

(2) Efficiency, which includes a low resistance to flight, ability to fly with



This is a model of the "Rotaplane" invented by one of our readers. The rotors are simply rotating flat strips of wood. More will be published on this method in a later issue.

a very high or very low speed and to carry a relatively large useful load.

The present type of airplane, as everyone knows, is not inherently safe because it stalls readily in the air and requires a long take-off and landing. Again, in the absence of variable wing area, it is not very efficient because the large wing area needed to support the the plane at low speeds in taking off and landing retards the craft in the air. It does, however, have a fairly large useful load and its wings have a high lift-over-drag ratio (that is a high ratio of sustaining force to the lift of the lifting elements).

The autogiro will not stall and can land with a very short run. The main danger inherent in its operation is that the bearing on which the rotating wings turn might fail and thus freeze the rotor into inaction. However, this danger has been minimized by a double bearing so that if one fails the other still allows rotation. The autogiro thus is a very safe aircraft.

Its chief disadvantage lies in the fact that the rotating wings have more air resistance in flight than the wings of an airplane. It, therefore, does not carry so large a useful load and is not so efficient as an airplane of the same lifting capacity.

The helicopter, when it comes, will have all the advantages of the autogiro—plus that of being able to take off with practically no run—and will not have the autogiro's chief disadvantage. Its rotating wings will not have as much air resistance as either the rotating wings of the autogiro, or the fixed wings of the airplane, because they will be smaller than the autogiro's rotor blades since power instead of air currents will turn them on rising, hovering and landing. At full speed ahead this power will be cut off and the rotating wings will serve as small autogiro blades—presenting little resistance to the air—until the necessity for hovering or landing arises.

The helicopter, in the writer's opinion, is the type of aircraft that will hold the center of the stage immediately following the autogiro. Readers of his former articles in this magazine know his faith in it as the aircraft of the near future.

There remain two other theoretically practicable forms of aircraft to fit into the picture: (1) the paddle-wing and (2) the Magnus (or Flettner) rotorcraft. The writer has faith in the possibilities of both, but their invention is still very much in the dreamer's stage.

An aircraft having paddle wheels, either above or to the sides of its fuselage, with efficient easily controlled feathering blades, is an ideal which is theoretically possible and very desirable. With a motive power not very subject to failure—such as a Diesel engine or an electric motor—it would be both safe and efficient. The speed of rotation and the set of its feathering

(Concluded on page 59)

Will Rogers Takes the Air

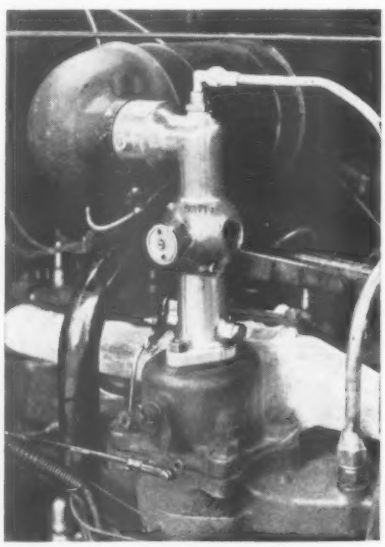
Will Rogers (center) is popular on the airways.

WILL ROGERS, the well-known comedian, journeys extensively by air and always makes it his particular business to become acquainted with the crew. Many pleasant hours have been spent in this way by all concerned, but the pilots are particularly jubilant over the "lines" that Rogers has put into his latest play concerning the airline pilots.

"The airline pilot, flying through storm and fair weather alike, with his precious burden of human lives, represents the best and bravest that there is in a man. He is chosen for his courage, resourcefulness and judgment in the face of danger."

A Novel Carburetor

HERE is a new carburetor that acts on the general principle of the old-time mixing valves, insomuch as the flow through the nozzle is positively controlled at each piston stroke by a valve.



This carburetor has shown excellent results.

Elements of Airfoils

THE following is a tabulated review of the properties of wing-sections or airfoils, covered up to date in the "Practical Lessons in Aviation." Examine them carefully, for the next article in this series will appear in the next issue.

1. *The total lifting effort of an airfoil or wing is due to the reaction of the downwardly accelerated air.*
2. *The greater the mass of air deflected downwards, or the greater the rate of acceleration, the greater will be the lift.*
3. *Under normal flight conditions, the effective pressure on the lower face of the airfoil is above atmospheric pressure, while over the upper surface, the prevailing pressure is below atmospheric pressure (partial vacuum).*
4. *The high pressure on the lower surface, due to the impact of the air, is called the "dynamic pressure." The reduced pressure over the top of the wing is the "induced lift."*
5. *The total lift of the airfoil is the sum of the impact pressure and the induced lift.*
6. *The lift increases with an increasing angle of attack (within limits).*
7. *Below a certain minimum angle attack, called the "angle of zero lift," the lift ceases.*
8. *Above a certain angle of attack (approximately 14° to 18°), the lift again falls off quickly. This critical angle is called the "burble-point" or "stalling-angle."*
9. *At a relatively small angle, called the "optimum angle of attack," the greatest lift is obtained for a given drag.*
10. *The velocity of the air is greatest over the top of the wing and at a minimum beneath the wing surface. (Bernoulli's Theorem.)*
11. *Drag is the resistance offered to the forward motion of an airfoil in an air-stream.*
12. *Drag may be divided into two components: (1) Profile drag; (2) Induced drag.*
13. *Profile drag is due to the simple shearing of the air by the airfoil and depends upon the area and form of the airfoil.*
14. *Induced drag is a component of lift. It increases when the lift creases and is zero when the lift is zero.*
15. *The total drag is the sum of the profile and induced drags.*
16. *The "lift-drag ratio," or the (L/D), is the figure of merit for an airfoil. The greater this ratio, the greater will be the load lifted per pound of drag and the less will be the power required for propulsion.*

Details of the New Waco "D"

by MAX KARANT

A description of the new Waco military plane which is designed for small foreign governments or wherever a small and economical air corps is necessary.

FOR the past several years small foreign governments, particularly those of Latin America, have used large numbers of Waco airplanes for military fighters, bombers and trainers.

In the past, these machines have merely been standard commercial ships converted into military ships either by the purchasing government or the manufacturer. Early last month, the Waco company announced their first specially designed military machine—the Model D two-place pursuit biplane shown in the accompanying photographs.

The Waco Model D is a single-bay staggered biplane with the upper wing in two panels joined at the center line of, and slightly above, the fuselage at about the eye level of the pilot. Visibility above and below the upper wing is practically uninterrupted as there is no center section, the wing itself tapers in thickness toward the center and extensive cutouts are provided at the roots of both wings.

The cockpit is covered by a transparent sliding enclosure and contains complete dual, adjustable controls; an adjustable bucket seat for the pilot; a throw-over seat that permits the observer to ride either facing forward or backward; radio receiving equipment; landing lights, flares and a complete set of blind flying instruments.

The ship's armament includes three .30 caliber Browning machine guns, two of which are installed in the lower wings of the machine outside the propeller arc while the other is of the flexible type and is in the observer's cockpit. Two U.S. Air Corps type A3 bomb-racks are mounted in tandem beneath the fuselage and can accommodate either five 25-pound bombs each or two 125-pound demolition bombs. They are operated by the observer who is provided with a negative lens bomb sight.

Three-quarter front view of the new Waco Model "D" military plane powered with a Wasp "Junior" engine. A sturdy plane for all-around service.

Fully loaded and powered with a Pratt and Whitney Wasp Junior 420 h.p. engine, the machine's performance at sea-level is as follows: top speed, 195 m.p.h.; cruising speed, 172 m.p.h.; stalling speed, 54 m.p.h.; climb, 1,800 feet per minute; service ceiling, 22,400 feet; and a cruising range of 660 miles.

When this issue of POPULAR AVIATION reaches the newsstands, the new fighter will have completed its Department of Commerce Approved Type Certificate tests after which it will be submitted to Waco's military market for consideration.

A great interest is being taken in military planes of this type by nearly all nations, with the possible exception of the United States. They are a prominent feature in China and in various other Asiatic countries where they are used extensively on patrols or for the pursuit of bandits and other criminals.

In peace-time aviation, ships of this general type are highly desirable in the service of revenue departments for catching smugglers, for forestry fire-patrols, for coast guard service and similar governmental "odd-jobs" as well as in the strictly military arm. And because of their quick maneuverability, they are a match for many a faster military plane that does not possess this essential military quality.

By sacrificing some speed in favor of maneuverability and low cost operation, a tactical unit can be built up that fits into a rather neglected corner of military aviation. A low-priced economical plane permits of many operations that are impossible in view of the present closely trimmed budgets. They permit more extensive flying practice and a better trained personnel than is the case with a few very expensive high-powered and high priced planes.

In actual service, during the recent Chinese-Japanese operations, it was repeatedly proved that the lighter planes were a match for many of the highly expensive pursuit ships with many m.p.h. in their favor. The ability to stunt and maneuver quickly, gave the light ships a very decided advantage over their faster adversaries. This is vouched for by several officers in the Chinese air corps who have visited P.A.'s offices.

It would seem that such ships would be of particular advantage in national guard organizations for training, flood relief, mobs and similar service.

The Waco Model "D" in flight, showing the cowl covering and the tail-group arrangement.

Did Whitehead Precede Wright

by
STELLA RANDOLPH
and
HARVEY PHILLIPS
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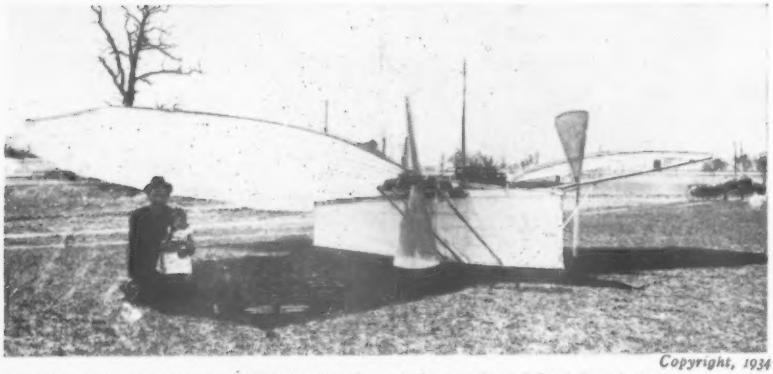

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Plane No. 22, in which Gustave Whitehead made a circle over Long Island Sound, January 17, 1902. Whitehead and his daughter are beneath the wing.

BEFORE 1901 had ended, Gustave Whitehead had built fifty-six airplanes. The first ones were turned out without numbers being assigned and that is why, in August, 1901, the machine under construction was only No. 21.

One day, it was pushed into the street from the backyard of the modest house, 241 Pine Street, which was then the Whitehead home. For weeks women in the neighborhood had been exclaiming about the fineness of the silk they were sewing into the wings of this airplane. Even a young man, loitering about the neighborhood, was pressed into service to help sew.

No labor unions or NRA set the wages, for the young man received twenty cents to the women's fifteen. Now, the wings were neatly folded back against the boat-shaped canvas-covered body as it was being pushed through the gate. Inside it, two engines were humming, one for propelling the wheels on which it was to get its start upon the ground, the other to turn the propellers when the machine was in the air. The small boys of the neighborhood came running, attracted by the unusual.

Little Alexander Gluck was there and so was an older friend of Mr. Whitehead, Louis Darvarich, who had worked with him long before they came to Bridgeport in 1900. Other spectators came flocking, shouting and exclaiming round-eyed at the monster. They drew excited breaths of awe, and whistled through their teeth as the creature dashed down the road, rose from the ground, not many feet higher than their heads, and flew above the dirt road that was then Pine Street.

But too many children running about add to the dangers of such tests. So, morning after morning, the plane tests were made before many of the little ones were up and about—or many of their elders either. Even then, one day Gustave Whitehead's heart was in his mouth as he barely missed striking a little boy who ran excitedly into the pathway of his moving plane.

On most of his test flights a mechanic-helper accompanied Gustave Whitehead. Anton Pruckner remembers well some of these flights. One of the longest was made in August, 1901, and was about a mile and a half in length, as Gustave Whitehead wrote the editor of the "American Inventor," who published the letter in the edition of April 1, 1902.

The Phillips Aeronautic Library furnished me the information that led me to this letter and also on the long trail which has not ended, but continues to broaden as it discloses the genius and ability of Gustave Whitehead.

The airplane used in 1901 had been constructed by Mr. Whitehead in its entirety; both engine and plane were his own idea. It was a monoplane with a four-cylinder two-cycle motor located forward. Ignition was of the make and break type and Columbia dry batteries were used. The gas tank was gravity fed and held two gallons of petrol. The body of the machine was constructed of pine, spruce, and bamboo, reinforced with Shelby steel tubing and piano wires. The wing coverings were of Japanese silk, varnished and fastened to the bamboo struts with white tape. The wings spread out behind the two propellers, and were supported with wires running to a central mast. The entire thing weighed approximately 800 pounds. With Mr. Whitehead aboard the weight was increased to about 965 pounds.

The mile and a half flight, made August 14, 1901, occurred at Lordship Manor, now a suburb of Bridgeport and took place somewhere in the vicinity of the site of the present Sikorsky airplane factory. Junius Harworth, then a young boy assistant of Mr. Whitehead, remembers the flight distinctly and in detail.

Gustave Whitehead was modest about proclaiming his achievements. He sought perfection. When he had flown, this was not sufficient. He must do better. In fact, Gustave Whitehead was never satisfied. Ever since, at an early age, he had constructed his first pair of wings and attempted a secret flight with them, he had been dissatisfied with his own inventions.

The great Lillienthal was his friend and model; successful gliding was at that time his goal. When he could glide, Gustave Whitehead would not be content until a motor drove his glider. A steam motor did it, but it was too heavy to seem practical and it required too heavy a load of fuel to send it far. Gunpowder, ammonia, acetelyne, gasoline and even kerosene served his purpose by turns.

And when he had mastered motor construction and had flown again and again, he knew he had not yet reached the desideratum of flight. Airplanes must rise vertically from the ground, declared Gustave Whitehead to his dying day, if they were to become practical and to that end he toiled on through the years.

He was one of the few men who made

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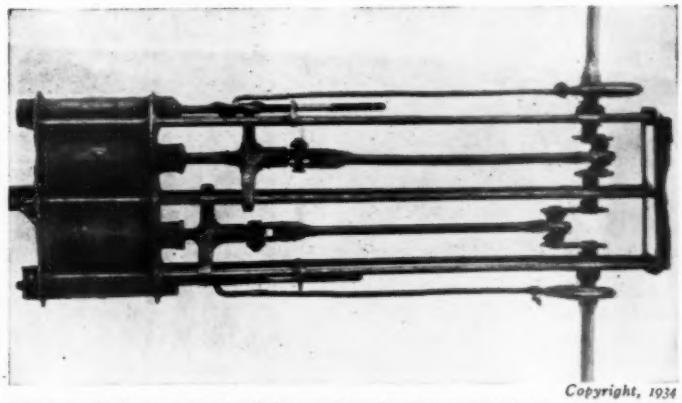
Gustave Whitehead, the aviation pioneer, inventor and flyer. He built 56 airplanes before 1901 and performed several successful flights.

In World's First Power Flight?

THIS presentation, the result of much investigation by the authors, will come as an eye-opener to many of our readers. It is a chronicle of an early experimenter and inventor in aviation who, for some reason, was never given the proper credit for his inventions. If Gustave Whitehead was not the original inventor of the airplane, then he came so near being so that he deserves unlimited acclaim.

Like other inventors in aviation, he was a plain mechanic—not a technical man. This is one reason for the practicability of his constructions which enabled him to fly long before the Wrights flew at Kittihawk with a powered plane.



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The two-cylinder steam engine built and flown by Gustave Whitehead. The bore and stroke were about 1"x1⅝", the motion being communicated to the shaft through a piston rod, cross-head and connecting rod. It was built from sheet and bar steel, the parts being brazed or wired. The overall dimensions are 12½"x6"x1⅝". A very simple light construction.

both his own airplane and motors. So able was he at motor construction that he might have made a small fortune from the manufacture of motors alone, had be been willing to confine himself to this, but an inventor's genius cannot be confined so readily. He constructed revolving motors, motors of two and more cylinders, motors of increasing horsepower and a tester for determining the thrust they would afford.

His tester, crude though it is, remains today as additional evidence of the genius of this remarkable man. Much of his construction was done by his own hands. Occasionally, a wooden pattern would be sent to some shop to be made up into metal. Even his house, in which his widow lives today, was constructed by his own hands with the aid of his then small son.

He was essentially the mechanic type, better able to carry out his ideas in wood and metal than to work them out on paper or with blueprints.

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Louis Darvarich, who flew with Gustave Whitehead in Pittsburgh, Pa., 1899. He was the fireman who fed charcoal to the furnace and boiler that created the steam for the flight. Unfortunately he was badly scalded in a crackup.

So it was that Gustave Whitehead, instead of broadcasting his flight of August 14, 1901, or any of his others previous to that, confined himself to his self-appointed task. While he was striving for perfection in the United States, Santos Dumont, in France, was steadily pushing ahead toward his goal of constructing a petrol-driven airship, or "blimp" as it would be undignifiedly characterized today.

The afternoon of October 19, 1901, a group of frock-coated, silk-hatted, bearded officials importantly appeared at the Parc d'Aerostation at St. Cloud. They represented the French Aero Club. In addition to the officials, a considerable crowd had gathered. They had come to watch Santos Dumont rise into the air, which he did at 2:43 P. M. in his sixth airship, and take-off in the direction of Eiffel Tower.

Santos Dumont's interest in the Eiffel Tower lay in the offer of 100,000 francs that M. Henry Deutsch had offered as the prize for the first petrol-driven airship that rose from the Parc d'Aerostation at St. Cloud and circled the tower, returning to its starting point, all this to be accomplished within the unheard of brief period of not more than a half hour. Santos Dumont won the prize with 29 seconds to spare.

Above England floated a balloon in which rode the Hon. C. S. Rolls, Frank Hedges Butler and Miss Hedges Butler of the United Kingdom. As they floated they thought, and their thoughts resulted in the creation of an Aero Club for their native isle. Promptly it was formed, and from this beginning in 1901 the present Royal Aero Club traces its ancestry.

Throughout that same year, 1901, Captain Ferber, in France, and Octave Chanute, in the United States, were continuing their research with gliders and seeking means of turning them in circular movements in the air. In the fall, at Kittihawk, the Wrights were also trying out a glider, a biplane with the enormous wing area of 308 square feet. This was larger than they had used when making their glider flight at Kill Devil Hill, July 27, 1901.

Before winter had come, they could say they had learned one thing that year, namely, that by shifting the position of the body while operating the glider, the pilot could make his machine travel a distance of as much as 300 feet. But they were not greatly encouraged. Said Wilbur, "'Man will never fly in a thousand years." Chanute's encouragement, however, did much to keep the brothers at work with their research during the winter.

It was also the year 1901 that Samuel Pierpont Langley, having made and flown steam-propelled airplane models and thus demonstrated the necessary laws of aerodynamics, remarked, "I have brought to a close the portion of the work which seemed specifically mine—the demonstration of the practicability of mechanical flight—and for the next stage, which is the commercial and practical development of the idea, it is probable that the world may look to others."

That winter of 1901-02 was a busy one for Gustave Whitehead. On the afternoon of January 17, 1902, the weather looked promising. It was the day he and his helpers had been seeking, so they quietly took their new plane, No. 22, to the beach outside Bridgeport and started its kerosene motor. The intention was to make some short trial flights, out over the Sound.

Gustave Whitehead took his place at the controls of the machine, the men gave it a preliminary push, and it trundled away on its three wheels and was off!

The plane performed so admirably that its owner continued his flight for a

XUM

distance of two miles over the Sound, following the shore line of the beach, although he had intended to make only short flights of not more than half a mile. The men pulled it ashore, and now Gustave Whitehead proposed to fly *across* the Sound.

He took off again, and at a height of 200 feet, was steadily progressing out across the Sound and out of the view of his helpers, when it occurred to him that it might be interesting to see if he could make his machine turn about and go back to its starting place. He turned the rudder slowly and drove one propeller faster than the other. With a thrill he realized his scheme was working.

Steadily and rapidly the machine came about until he was facing his starting point. As he neared his rejoicing helpers on the shore, he slowed the speed of the plane and again dropped it gently into the water. It had traveled a distance of approximately seven miles, not across the Sound, but it had made the first turn in the air so far as has been recorded. Thus, on January 17, 1902, Gustave Whitehead carried out the suggestion of Langley that others should demonstrate the practicability of mechanical flight.

That he accomplished this feat, Gustave Whitehead testified himself in a letter to the editor of the "*American Inventor*," to which the editor gave sufficient credence to publish it. This fact is further substaniated by affidavit of Whitehead's assistant, present upon this occasion. Once more Gustave Whitehead had set out to travel a given distance in the air and had exceeded all expectations.

The machine used upon this occasion was similar to the one used in August of 1901. The thrill of the experience exceeded any within memory except that early one in the Oakland suburb of Pittsburgh in the Spring of 1899, when a much cruder, steam-driven model had carried him and his assistant a distance of almost a mile.

Firemen from the nearby No. 24 engine company had lent their assistance that time to start the machine, while the assistant fed charcoal to the flame which heated water in the ordinary kitchen boiler which they were using. The firebox had a sheet of asbestos at its base, then a sheet of iron over that, while the walls were made of clay. The engine itself was a two-cylinder one with a 4-inch bore and 10-inch stroke.

No one expected the machine to go far on that eventful day. A distance of a few rods would have been sufficiently convincing in those days. But as they went onward and upward, steered by Gustave Whitehead at the controls in the front, they exceeded the distance originally planned and found themselves headed for a three-story brick house. Afraid to attempt to swerve, there was but one hope, namely that they might clear the top of the house. But they failed. Down fell the ma-

(Continued on page 55)

The F.A.I. Holds a Convention in Washington

Four prominent figures in aviation. Left to right, Admiral Ernest King, Major Chester Fordney, Prince Georges Bibesco and Senator Hiram Bingham.

DELEGATES from 21 countries met at Washington, D. C., on October 9, for the opening session of the annual congress of the Federation Aeronautique Internationale, otherwise known as the F.A.I.

This is the aeronautic sport governing body of the world, of which the National Aeronautic Association is the American representative. No aviation record can be internationally recognized unless passed upon by this body. Practically every country belongs to the F.A.I. with the exception of Soviet Russia.

Reading from left to right in the photograph we find, first, Admiral Ernest King, Chief of the Naval Bureau of Aeronautics; Major Chester Fordney, U.S. Marine Corps, who received the medal for Lieut. Settle's altitude record; Prince Georges Bibesco, Roumania, president of the F.A.I., making the presentation; and Senator Hiram Bingham, president of the National Aeronautic Association, who received a medal for Wiley Post.

The Aero-Sportswoman

by JOAN THOMAS

PSYCHIATRISTS say that it is bad business to allow oneself to daydream—"wishful-dreaming" they call it. Well, perhaps it is, but we have had a lot of fun doing just that and strange as it may seem, a lot of those dreams have been realized.

The latest one was the chance to turn (only briefly we are sad to say) into a *roving reporter*. When Clayton Patterson told us she was moving to the Carolinas, we offered to help drive the family chariot down through the Great Smokies. This gave us the opportunity to visit the national headquarters of the Women's National Aeronautical Association at Dayton and to inspect Wright Field; to help start a 99 shrine in Mammoth Cave and to fly a few circles around Stone Mountain in Georgia.

Dayton, the home of the famous Wrights and the scene of their first box-kite experiments, is rightly (no pun intended) one of the most important places in the flying world. Wright Field, the great experimental laboratory of the Army Air Corps, is a fascinating place with its famous wind tunnels, testing blocks, elaborate chemical and physics laboratories, etc. A new building that will house the Aviation Museum, that unique collection of things aeronautical, is nearing completion on the Field. Our stay there was all too brief, but we are sure that every flyer and air-minded fan will find it well worth a visit.

Mrs. George Shaw Green, national president of the W.N.A.A., and Martha Smith, president of the local unit, entertained us royally and showed us everything in Dayton from the model dog-pound to the museum. It was our pleasure also, to meet Mrs. Marguerite Jacobs Herrin, who is national secretary of the W.N.A.A. and Iona Coppedge, a Dayton 99, both of whom are employed at the government field.

The idea of starting the 99 shrine in Mammoth Cave was Mrs. Patterson's inspiration. Those who have visited the cave will remember the weird ef-

(Concluded on page 52)

Developments in Crop Dusting

by HENRY W. YOUNG

Just a few years ago, crop dusting was conducted with crude appliances, but of late, this has become a real industry, effective and of great service to the farmer. Read how one man built up a fine business.

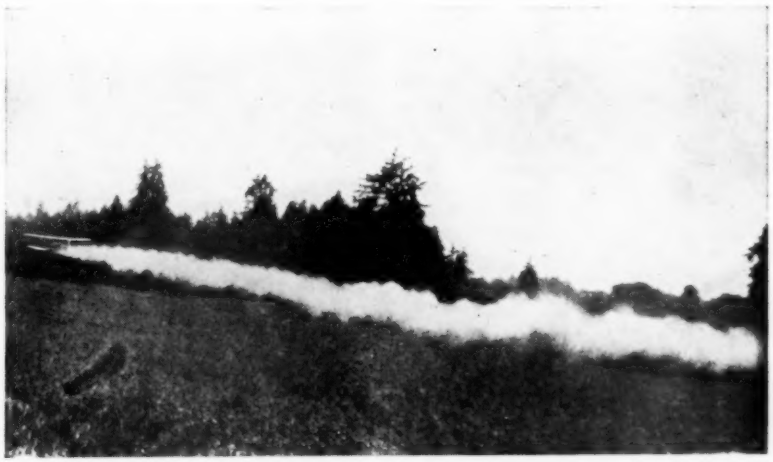
A "LAY-DOWN" of chemical dust to control plant infestations and diseases, covering several hundreds of acres, can be made by an airplane in a few hours.

Other ways of doing it are by men on foot, carrying heavy loads, men on horseback, by horse-drawn vehicles or tractors. These older ways call for days of hard work at stages in the life cycles of these destructive hosts when time is an all-important element.

Dusting by airplane is extensively carried on in the cotton fields of the South, the fruit orchards and ranches of the Pacific Coast and in certain sections of the Middle West. Yet the United States Chamber of Commerce, in its 1932 Aeronautic Trade Directory, listed less than 20 operators. So it may be said that airplane dusting, as a complete service, is only just getting under way. But it is a business that will undoubtedly spread throughout the country.

Leslie G. Boyd, Portland, Ore., who had spent years as a barnstorming aviator, getting nowhere, took note of these facts and determined to build up a business in that line. This was less than five years ago, when there were even fewer in it than in 1932. He had less than a thousand dollars saved up, but it was enough to provide a remodeled plane and permit him to make many free demonstrations at fairs and farm gatherings. Indeed, he earned little during the first two years, but throughout the Pacific Northwest his pioneer work became noised about.

Then, the idea took hold and business began to pick up over night. Today, he operates three planes, employs licensed pilots and tenders to farmers and fruit growers a complete service. On contract with them, he makes a thorough preliminary study of the crops, selects the insect and disease controls, buys the materials in bulk and mixes them and at the proper time makes applications to protect the crops during the periods of their development.



A "lay-down" of chemical dust by an airplane to control pea-weevil in Austrian field peas.

One of the obstacles he had to meet was the notion, still prevalent, that anything having to do with airplanes was very costly. Probably it was handed down from the days when one might be carried aloft for a thrill at a dollar or more a minute. But in the same way that commercial airlines have proved that flying, all things considered, may often be more economical than any other mode of transportation, so have airplane dusting operations, when undertaken on an acreage reasonably large, say 100 acres and up, proved to be less costly to the grower than hand, horse or tractor methods.

His operations cover a wide variety of applications; dusting, fertilizing, seeding, and pollenization in connection with orchards, vineyards, and most classes of low-crop truck and small-fruit farms.

Insect and plant disease controls, in the form of chemical dusts, are placed in a specially designed hopper in an airplane. This is then flown at a speed of 125 miles per hour, at from 5 to 25 feet above the crop. Specially designed valves and venturii, under the control of the pilot, release the dust in such a way that the slipstream of the propeller, coupled with the down-wash of the wings, imparts a heavy turbulent roll to the dust.

It is broken up, spread out and "pushed down." In this way, the undersides of the leaves, as well as the top surfaces of the plants to be treated, receive a film of dust. Spraying by airplane or any other method is now on the wane. In most cases, the dust does the work more effectively, and the excessive poundage of liquids is eliminated.

The trail of dust, called the "lay down," is from 75 to 150 feet wide. There is no loss from trampling, or any contact that might cause mechanical injury to the crops. Neither is there any delay due to ground conditions.

It is the study of the insect pests, the fungus and bacterial diseases, their life cycles, the selection of the proper chemical control for each individual case and an everlasting vigilance on the part of the dusting service operator, in properly timing the application, that are most important. Adherence to the last-named factors is what distinguishes

Compare this antiquated hand spraying method with the airplane dusting system above. One takes days to hours spent by the other.

the work of a competent dusting service organization from that of a man who can merely fly and spread materials, either by guess or under the instructions of others little better versed in these matters than himself.

Three Model A-3 Eagle Rock biplanes with 150 h.p. Hispano motors constitute Boyd's present equipment. He has practically rebuilt them throughout in his shop to carry the 800-pound capacity hoppers and the distributing mechanism. The latter is largely of his own design.

About the smallest quantity of chemicals applied to an acre in any case is 10 to 15 pounds. This may run up to as high as 100 pounds in the case of some orchards. The minimum price per acre may be put at $1.60 to $2 and the maximum at $5, for the ordinary or complicated formulas. It should be understood, however, in services of this kind, that not only is the steady bulk-work involved, but also special jobs that require more or less costly investigations and the application of unusual and more costly chemicals. These special cases may run up to $15 an acre.

The foregoing may seem complicated. But when it comes to actual work, it is possible to give the grower an actual figure to consider, which takes into consideration all the different elements. At this figure, varying with the individual, Boyd undertakes to protect the crop.

A rather interesting contractural relationship is entered into between Boyd and the grower. This is initiated in the fall or winter, generally some months before operations. First comes what is known as a "service agreement." Boyd agrees to inspect the crops for the purpose of ascertaining what insect pests or diseases may be affecting them.

It is also agreed that there shall be at least 100 acres available at the time of each application. Also, it is agreed that, prior to the time of each and every application, a regular service contract shall be executed by the grower.

This service contract specifies the poundage of materials, the number of pounds to the acre, the time of application, the sum to be paid per acre exclusive of materials. As a separate clause, it is further agreed that the grower shall obtain from Boyd a specified number of pounds of a specified chemical or chemicals at a specified price.

There are still further stipulations as to terms of payment and also to the effect that the operator shall not be held liable for damages for failure to make applications, owing to adverse flying or weather conditions beyond his control, or for injury to livestock which may feed on the chemicals. In building a complete and reliable service, Mr. Boyd emphasizes the following factors as essential:

Employment of scientifically trained

(Concluded on page 50)

A New Swedish Transport Plane in Service

An unusual point is the landing-gear construction.

THIS four-motored Fokker monoplane carries 22 passengers, two pilots, a radio operator and a steward. It flies on a regular schedule between Malmo, in Southern Sweden, and London, England. It is interesting to note that the four engines are Pratt & Whitney "Wasps."

Where the Danger Lies

by ED NELSON

AFTER all these years in the flying game, I am just beginning to realize where the greatest danger lies.

Is this the danger of spinning in? No. Can it be charged to the wings blowing off? No. Is it due to an aggravated case of the heebeejeebees (cockpit trouble) on the part of the pilot? No, not a bit. On the contrary, I find the mechanical end of aviation so safe and lacking in thrills that I am compelled to enter a row-boat race or a game of shuffle-board to work up a good old-fashioned scare.

Just to prove that I'm right, I'll call your attention to the fact that the old-time pilot could be distinguished from his fellow citizens by deep weather-lines around the corners of the eyes, the heavy coat of tan and the lean taut expression which became a matter of habit. But nowadays, the carefree airport strutter must parade around the grounds with the old helmet, boots and other flying togs before he is recognized as an airman.

The new dangers that have just come to my mind are totally different and leave altogether another kind of mark upon the visage—more like the expression on the face of a busted bank president or the face of the ex-president of a has-been corporation. This is the mark of worry and not the constant proximity of danger.

First, and gravest of all the present dangers, is the loss of your license for lack of flying time. If you haven't flown enough hours recently to satisfy the Bureau of Air Commerce, you just don't have to worry about anything else concerned with aviation after that. Out comes the old log-book, and if she's shy a few hours on flying-time, it will be just as well if you consider going in for mattress making, cultivating Belgian hares or some other light sport.

Worry No. 2, that causes wrinkles around the eyes, but no sunburn, comes from worrying about what that damn examining physician will find when you next take your shirt off in his presence. This is another dire danger that has planted its pilots by the score. If he finds your blood pressure up to 1,987,-569 millimeters of mercury, you'll sure be missed around the hangars. And how—yet.

Then comes Worry No. 3, due to the depression—and other things. And that begins: "How inthehell am I going to raise the money for gas and oil or for paying the hangar rent?" And, again, one must eat you know! How is one to fly, I ask of you, with a dozen liens slapped on the crate and with a big ground crew of collectors in the offing? These are all real dangers that, from time immemorial, have grounded more flyers than all of the tail spins ever pulled off.

And then we have Worry No. 4 in the person of the Bureau of Commerce inspector. Where he is, when will he arrive and all the rest of it. No telling when he'll poke a knowing finger through the wing fabric and gently roar, "Recover it." And, what a desperate shock this gives our sensibilities!

The old eagle glare, or the fixed tense expression of the 1919 barnstormer, no longer comes from desperate flying stunts or from hunting out holes in the cumulus clouds. Nay, nay, brother, it comes from searching out inspectors and creditors in the crowd to avoid a recovering job or another top overhaul on the old kicker. You bettcha!

And yet, somehow, the pilots still hang on. The least of the danger is in the air—the big danger is on the ground, usually walking around on two legs and you'd have to meet them anyway, in one form or another.

Flying Barn Doors vs. Airplanes

by LEWIS W. BROCKER

In which the author laments the lack of real development in airplanes, and sorrows over the fact that the only weapon possessed by modern airplane designers is—more horsepower. It would be nice if we could fly at a good speed with a safe and sane ship and a reasonably proportioned motor.

"YOU can fly a barn door if you have enough power!"

That expression first reached my consciousness in the hectic period of 1928-29, when nearly every town boasted its airplane designer and potential factory.

Those were the days of high-powered promoters and wild predictions. Man had conquered the atmosphere and five years would see him in the stratosphere traveling fifteen hundred or maybe two thousand miles in sixty fast-moving minutes. Passenger lines were to maintain a four hundred-mile-an-hour schedule. Helicopters were to be hopping out of backyards.

Here it is—the year of NRA, nineteen hundred and thirty-five. The six years have flown a lot faster than the airplanes that were predicted. Looking backward, which seems to be the natural dirction to look for airplane development, we well may ask just where in Oshkosh are we headed with respect to airplane design?

When that wild-eyed lad, who was dishing out the publicity, shouted, "Speed!" he opened the field of airplane development with reverse English. The engine builders were already turning out more powerful engines and the airplane designers had a formula. Speed increased as the cube root of the additional horsepower and lift increased as the square of the speed. Very simple.

Wishing to add thirty miles an hour to the top speed of his plane, the designer tied a couple of hundred more horses to the front end and, taking his little saw, he cut off twenty or thirty square feet of wing surface until it took on the general contour of a barn door. For some still unproven reason (Do I hear someone shout, "Visibility"?)

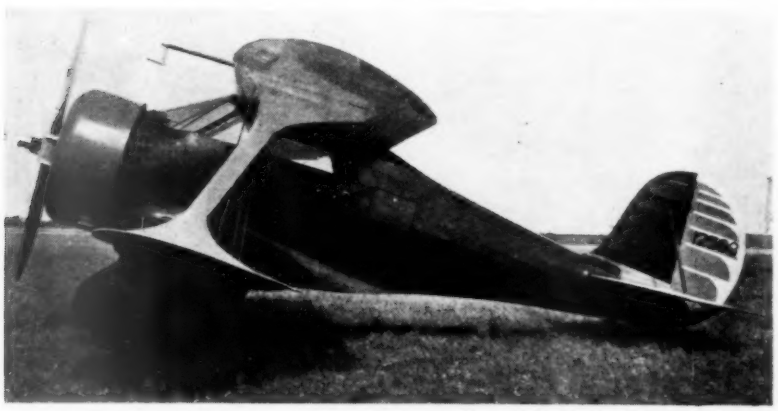
Here is the Miss Los Angeles, an overpowered clipped wing racer of which Mr. Brocker speaks. We have no personal pick on Miss Los Angeles except for the class that she represents.

the engineers had already made monoplanes of most of their biplanes.

The result was an increase of thirty miles an hour in top speed. And she also landed about thirty miles an hour faster to sort of even things up.

It has been suggested that, in some instances, if the co-pilot would extend his arms over the sides of the fuselage he would convert the monoplane into a biplane, thus doubling the wing surface and cutting the landing speed in half.

Be that as it may, wing flaps have been added to achieve more lift and a consequent reduction in speed when landing. In speaking of the new models, the landing speed is conveniently disregarded. If it is mentioned, the wing flaps, which reduce the speed of landing from around ninety to fifty or sixty miles an hour, are pointed out.



And here's Walter Beech's "Beechcraft," a real development in flying, economical, fast and safe, but still a long way from the ultimate goal.

Let us consider, for a moment, what may be called the efficiency factor of an airplane. In its simplest form it is the combination of the ratios between the top speed and the slowest cruising speed and the top speed and the landing speed, taken without wing flaps, slotted wings, or other extraneous attachments.

These ratios should not vary to any appreciable degree on the various types of commercial planes. It is just horse-sense that the same elements, which make the small airplane for private use attractive to Johnny Public, will make the passenger line a paying proposition.

The things which make any plane desirable are structural strength, economy, and performance, in the order named. American designers have begun to ignore the safety advantages of slow landing speeds, the structural strength of the biplane, the greater efficiency of combination wings and the added maneuverability of slow cruising speeds.

Real engineering comprises simplicity. Designers have about reached the maximum that may be obtained by removing wing surface and streamlining parts. America still lags behind England and other nations with regard to top speed and general performance. The Department of Commerce and state laws have clamped the chains on Archie Amateur and left him struggling in the quicksands of oblivion.

Air power is generally recognized as the greatest arm of national defense. The flying nation is conceded to be the safe nation. We can fly barn doors, but it is the airplane that will win battles and carry the commerce of

the world. The designing engineer, like the ostrich, has buried his head in the sand, blinded himself to what is being done in other countries, and stuck to the single-track idea of removing wing surface and tacking on appliances to make up for performance deficiencies.

But now they have reached their millenium. All they have to look forward to is an engine which will pull more horses with the same weight. Is it enough? If not, where do we go from here? It looks as if we might have to start again at the beginning, with more efficient engines as our chief advantage—or disadvantage.

It was engine efficiency which blinded the designers to the possibilities of the airplane. Flying controlled power cannot put efficiency into flight. Efficiency comes from greater performance with the same or less power. Will the future give us airplanes or barn doors?

Manufacturers and designing engineers have long toyed with the fallacy that when the top speed is increased the landing speed must be increased in direct proportion. That when one phase of performance is emphasized another must be sacrificed. To a certain extent this is true, especially in regard to our present formulae. Physics tells us that for every action there is an equal and opposite reaction. But the formulae may be changed and the reactions thrown into beneficial channels with the development of more efficient airfoils and airfoil combinations, as well as careful attention to fuselage design.

Our greatest prospect is to give the amateur the freedom of the skies. He deserves it. He is the experimenter, unhampered by a charming disarray of mathematical formulae. And it is from open-minded experimentation that great developments generally evolve. Limited in horsepower and monetary resources, the amateur naturally seeks to get the maximum in performance from each horse that champs the bit under his hand-hammered cowling.

It is within the bounds of reason and belief that a plane will be developed which will be two hundred miles from its starting point in one brief hour, will climb to an altitude of ten thousand feet in a little less than six minutes, will idle to a hundred and ten miles an hour and hold its altitude, will retain its wings while doing a series of outside loops, and settle to a graceful landing at a speed of thirty-five miles an hour or less, after traveling twenty miles for each gallon of gasoline that passes through the carburetor.

This plane should carry a pilot and three passengers, together with their baggage. Larger planes, with approximately the same performance, would have a slightly higher fuel consumption, but it should be relatively the same per passenger mile. The perfection of the variable-pitch propeller will aid greatly in achieving this performance.

(Concluded on page 65)

A Few Old Ships for Our Photo Phans

The deHavilland-Four, more commonly known as the "DH-4" which was one of the leading British and American two-seaters. It was powered by a number of different engines, the Liberty-12 being used in a later edition, the DH-9.

The "LePere," one of the finest appearing of the wartime planes. Note the peculiar "portal" interplane struts characteristic of this ship. A few LePeres were built by the Packard Motor Car Company in this country.

The American defender entered in an early Schneider Trophy race. Built and powered by Curtiss, this ship made remarkable speed for the amount of power developed.

Further Studies in Bird Flight

by RAOUL J. HOFFMAN

The author, a well-known aeronautical engineer, has been devoting a considerable amount of time of late, to the analysis of soaring bird flight. And he now sets forth the results of his observations in this article.

WE have expounded a new efficient conception of the airflow: the concoidal airflow past an airfoil, especially past a low aspect-ratio airfoil.

Our assumptions have been deducted from observations of soaring birds, excluding the slot effect and flapping motion; but in absence of three dimensional flow tests our ellucidations for our new ideal airflow will be more theoretical until exact proofs may be derived from laboratory tests.

The air disturbances seem to be unnecessary and a copy of a bird's wing will always be fallacious as the speed

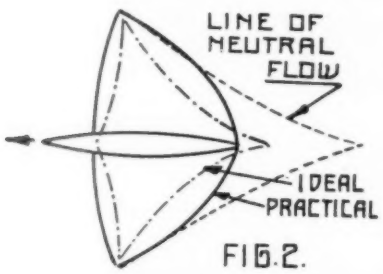


FIG. 2.

and chord relationship is quite different compared to the one we have on our present airplanes and more so on our future flying wings. We know that nature does everything the easiest way, with the least work, therefore the soaring of the birds will be accomplished with the least air disturbance.

We have found that a straight reflexed airstream has not the lowest air resistance, not even passing a streamline wing-section, therefore a slight deviation from the straight line will be more efficient and the flow will have a helical, or better—a concoidal path.

This cyclic flow may be divided into two main groups: one set passing under the wing and one set over the wing, having counter-rotation to each other as shown in Fig. 1. Two large cyclic flows below and two small cyclic flows above the airfoil, rotating in opposite directions, their kinetic energy of equal magnitude in order to neutralize their rotations after leaving the airfoil and thus coming to rest.

Above conceptions of an efficient airflow will lead us to a new basic design of drooping the median line to hold the lower flow within bounds and to cavitating the root of the wing at the upper surface—"GULL WING" and peremptory to the use of a centerbody above and below the airfoil. The body and the wing will

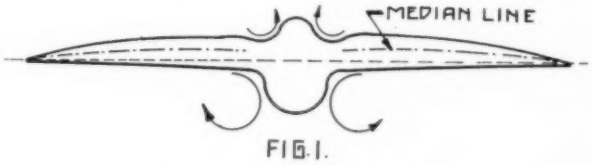


FIG. 1.

form the boundaries of the cyclic flow as shown in Fig. 1.

In order to have the airflow perform the maximum work, to conform with the pitch of the cyclic flow, the chord of the wing will have to be extended near the body. This will lead us to the low aspect-ratio flying wings and give us a fair explanation of the advantages of the "fillets" on standard airplanes, when the tail is in a correct relative position to the wing and body. Fig. 2 shows the application of the extended chord in designing a theoretical flying wing with its approximate limits of equalization area.

Considering the cyclic flow of the air, with the pitch towards the center of the airfoil and the pitch angle in straight relationship with the speed of the airflow, we find that the aspect-ratio will decrease as the speed increases using the same landing speed. Fig. 3 gives an idea what the future flying wing may look like.

Having assumed this cyclic motion of the airflow, the question arises where and how this rotation is started. Letting the wing do all the lifting—for sake of efficiency—the impulse of the cyclic motion will start ahead of the leading edge. Nature does that with the aid of the bird's beak, with its peculiar concave shape in order to deviate the airflow. The movement of its head during soaring into various directions

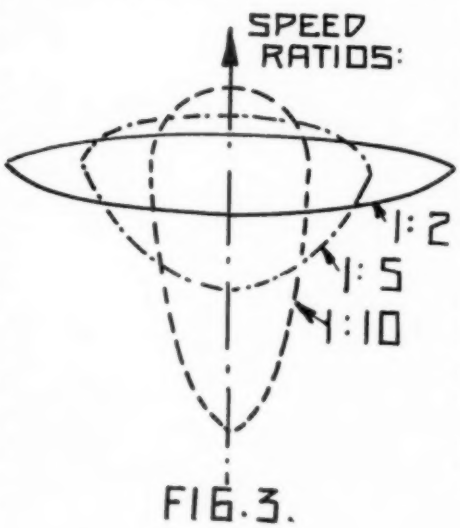


FIG. 3.

and the possible deflection of the airstream is equalized by the shape of the bird's neck.

To accomplish this effect in an airplane design, we have to extend the centerbody ahead of the wing in order to give the oncoming air the rotative impulse. This extended body will insure a very good vision for the pilot, and in case a single-engined airplane is designed, an inverted engine will be more advantageous for designing the cowling to start the cyclic flow.

From laboratory tests, we have found that the lower the aspect-ratio, the steeper the stallglide will be. This conforms with nature and the aspect-ratio

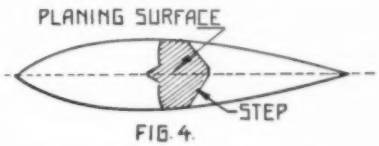


FIG. 4.

of the bird's wing depends on the way it catches its food.

A new explanation of the action of wingtip feathers will interest us: the reason of opening and closing the tip feathers while soaring. The usual explanation has been the well-known slot effect for higher lift. We assume this to be a valve effect and controlled solely by the airstream automatically. In normal flight-soaring or gliding, the slots are open to let the air pass through undisturbed and in case the airflow changes its direction downward, which may reduce the lift, the feathers close, thus creating a larger area and therefore equal lift—this may be applied to our present day airplanes.

Our great problem in designing an efficient airplane will be the correct wing-sections, shape of the body and the amount of "drooping" of the median line. They have to be found by extended laboratory tests. There is only one observation recorded by the N.A.C.A. of this cyclic flow on the upper surface and this was found on standard airfoil models in a test at 1,000-ft. per second.

It appears from tests made by Guidoni on streamline bodies that the airfoil will have its maximum thickness at 50-60 or even 100 percent of its chord, depending on the speed it will travel.

Our above conception of a concoidal airflow seems to work out very efficiently on a flying-boat bottom and viewing the active planing sur-

(Concluded on page 57)

A European Airway Directory

by JOHN S. CARTER

This comprehensive data on the European commercial transport systems will prove useful and informative to air-travelers and students of commercial airways.

THE British Air Ministry has recently made available some very interesting figures in respect to European Civil Aeronautics and scheduled air transportation. They were compiled from the records of eighteen European countries and cover the entire commercial aviation situation in Europe. It is particularly interesting to make comparisons between our own country and the whole of Europe. The figures dealt with are as of December 31, 1933.

In the eighteen countries there were 5,024 licensed civil aircraft. The United States, at the same time, had 6,896 licensed commercial planes. This alone gives an idea of the wide scope of civil aviation in the United States.

Of the 5,024 licensed civil aircraft in Europe, 929 were the property of air lines operating over scheduled routes. In comparison, we had but 504 planes in operation on scheduled routes. It is interesting to note, however, that the 929 planes in all of Europe had a scheduled weekly mileage of 1,112,392 miles, while our 504 planes had a scheduled weekly mileage of 1,047,942 miles.

This is graphic evidence of what high cruising speeds can do for air transportation. With about three-fifths as many planes we had almost the same scheduled weekly mileage as all of Europe. There is one thing to be considered, however. That is that some of the European planes carry from twenty to thirty-eight passengers. It is regrettable that the table does not give figures on the number of passenger miles flown so that a more accurate comparison might be drawn.

In the eighteen European countries there is a total of 28 air transport companies in operation. On December 31, 1933, there were 24 air transport companies in operation over regular scheduled routes.

Unfortunately, British and American methods of compiling statistics do not follow the same routine. We do not, therefore, have figures at hand at the moment to compare with the total available pay-load, average pay-load per H.P., total H.P. of aircraft, average H.P. of aircraft and average available pay-load per aircraft.

From what we have been able to compare, however, it is easily seen that the United States leads the world in air transportation.

Country	Total Number of Civil Aircraft on Register of Country	Operating Company	Total Number of Aircraft in Operation	Total Available Pay-load	Average Available Pay-load per Aircraft	Total h.p. of Fleet	Average h.p. per Aircraft	Average Available Pay-load per h.p.	Total Mileage of Routes Operated, 1933	Scheduled Weekly Mileage, 1933	Average Scheduled Weekly Mileage per Aircraft, 1933
				lb.	lb.			lb.			
Great Britain* ..	1,055	I.A.L. (1)	23†	113,665	4,942.0	39,040	1,696.1	2.9	13,709	64,560	2,807
Austria*	57	O.L.A.G. (2)	10	13,368	1,336.8	5,425	542.5	2.5	2,313	13,194	1,319
Belgium (including Congo)	173	S.A.B.E.N.A. (3)	31	63,755	2,056.6	20,310	655.1	3.1	3,032	23,578	761
Czechoslovakia ..	130	C.S.A. (4)	13	25,520	1,963.1	6,690	514.6	3.8	1,037	9,500	731
		C.L.S. (5)	14	25,783	1,841.6	8,280	591.4	3.1	1,421	15,990	1,142
		Total ..	27	51,303	1,900.1	14,970	554.4	3.4	2,458	25,490	944
Denmark	11	D.D.L. (6)	5	9,510	1,902.0	2,895	579.0	3.3	860	8,608	1,722
Finland	17	Aero O/Y (7)	4	7,540	1,885.0	3,175	793.7	2.4	991	10,606	2,451
France	1,654	Air France (23)	134†	237,232	1,770.4	91,075	679.7	2.6	21,450	130,670	975
Germany	1,072	Deruluft (24)	11	19,915	1,810.5	7,950	722.7	2.5	1,703	28,429	2,583
		D.V. (8)	16	15,900	993.7	2,400	150.0	6.6	896	12,035	752
		D.L.H. (9)	145	278,361	1,919.5	90,290	622.1	3.1	21,597	161,950	1,117
		Total ..	172	314,176	1,826.6	100,640	585.1	3.1	25,196	202,414	1,176
Greece	—	S.H.C.A. (10)	4	9,176	2,294.0	3,670	917.5	2.5	460	5,520	1,380
Hungary	—	Malert (25)	6	15,045	2,507.5	4,050	675.0	3.7	767	6,180	1,030
Italy	393	S.A.A.L.I. (11)	7	13,330	1,904.3	5,430	775.7	2.5	861	14,780	2,111
		S.A.N.A. (12)	16	37,191	2,324.4	20,000	1,250.0	1.9	1,697	14,686	918
		S.I.S.A. (13)	11	18,000	1,636 4	7,900	718.2	2.3	953	11,580	1,053
		S.A.M. (14)	31	55,604	1,793.7	24,110	777.7	2.3	3,944	26,872	867
		S.A.A.E.I. (15)	8	16,400	2,050.0	7,200	900.0	2.3	1,221	5,098	637
		S.A.N.A.A. (16)	4	8,800	2,200.0	3,360	840.0	2.6	830	3,980	995
		Total ..	77	149,325	1,939.3	68,000	883.1	2.2	9,506	75,996	987
Netherlands ..	67	K.L.M. (17)	34	86,315	2,538.7	32,435	954.0	2.7	11,360	53,020	1,559
		K.N.I.L.M. (18)	8	20,370	2,546.2	6,630	828.8	3.1	1,865	10,944	1,368
		Total ..	42	106,685	2,540.1	39,065	930.1	2.7	13,225	63,964	1,523
Poland	141	L.O.T. (19)	34	52,120	1,532.9	14,340	421.8	3.6	2,841	26,950	792
Roumania* ..	41	L.A.R.E.S. (20)	8	9,220	1,152.5	3,210	401.2	2.9	702	6,534	817
Spain	96	L.A.P.E. (21)	10	20,760	2,076.0	8,305	830.5	2.5	571	7,994	799
Sweden	26	A.B.A. (22)	5	10,473	2,094.6	4,180	836.0	2.5	1,156	11,086	2,217
Switzerland ..	82	Swissair (26)	12	21,325	1,777.1	8,105	675.4	2.6	2,464	19,866	1,656
		Alpar (27)	3	3,358	1,119.3	630	210.0	5.3	374	6,084	2,028
		Total ..	15	24,683	1,645.5	8,735	582.3	2.8	2,838	25,950	1,730
Yugo-Slavia ..	9	Aeroput (28)	9	6,856	761.9	3,265	361.7	2.1	949	8,274	919

* Details as at December 31, 1932. † Does not include aircraft in reserve or used for special charter work.

KEY TO OPERATING COMPANIES

(1) I.A.L. .. .. Imperial Airways Ltd.
(2) O.L.A.G. .. .. Osterreichische Luftverkehrs A.G.
(3) S.A.B.E.N.A. .. .. .. Societe Anonyme Belge d'Exploitation de la Navigation Aerienne.
(4) C.S.A. .. .. Ceskoslovenske Statni Aerolinie.
(5) C.L.S. .. .. Ceskoslovenska Letecka Spolecnost.
(6) D.D.L. .. .. Det Danske Luftfartselskab A.S.
(7) Aero O/Y .. .. .. Aero O/Y.
(8) D.V. .. .. Deutsche Verkehrsflug A.G.
(9) D.L.H. .. .. Deutsche Lufthansa A.G.
(10) S.H.C.A. .. .. .. Societe Hellenique des Communications Aeriennes.
(11) S.A.A.L.I. .. .. .. Societa Anonima Avio-Linee Italiane.
(12) S.A.N.A. .. .. Societa Anonima Navigizione Aerea.
(13) S.I.S.A. .. .. Societa Italiana Servizi Aerei.
(14) S.A.M. .. .. Societa Aerea Mediterranea.
(15) S.A.A.E.I. .. .. .. Societa Anonima Aero Expresso Italiana.
(16) S.A.N.A.A. .. .. .. Nord Africa Avia Zionesa.
(17) K.L.M. .. .. Koninklijke Luchtvaart Maatschappij Voor Nederland En Kolonien N.V.
(18) K.N.I.L.M. .. .. .. Koninklijke Nederlandsche Luchtvaart Maatschappij.
(19) L.O.T. .. .. Polskie Linje Lotticze.
(20) L.A.R.E.S. .. .. .. Linea Arien Romana E.S.
(21) L.A.P.E. .. .. Lineas Aereas Postale Espanolas.
(22) A.B.A. .. .. Aktiebolaget Aerotransport.
(23) Air France .. .. .. Compagnie Air France.
(24) Deruluft .. .. Deutsche-Russische Luftverkehrs Gesellschaft.
(25) Malert .. .. Magyar Legiforgalmi R.T.
(26) Swissair .. .. Societe Anonyme Suisse pour la Navigation Aerienne.
(27) Alpar .. .. Societe d'aviation Alpar Berne.
(28) Aeroput .. .. Drustvo za Vazdusni Saobracaj A.D.

XUM

Notes on Lightplane Design

by WILLIAM I. STIEGLITZ

Many practical points on the primary or basic points in the design of an airplane are taken up here by the author, a prominent engineer with extended experience in lightplane design.

THE design of any airplane is a series of compromises on the part of the designer, in an attempt to get the best all-'round airplane for the desired purpose.

It is, unfortunately, necessary in nearly all cases to sacrifice a little of one desirable characteristic in order to gain a bit of another and in the case of the airplane for the private flyer, this process is necessary to a larger degree than with any other type of ship.

In most commercial planes, there are certain definite demands of the market to be met and consequently the designer has something definite to work on, but in the case of the small plane there is no market worthy of the name at the present time.

Judging from the absence of any real volume of sales in the small plane class, it seems obvious that the public does not want the type of plane which has been offered to the market in the past, but knowing that the public does not want one definite type of plane is far different from knowing what type they do want. Consequently, in the absence of any information of this sort, the only thing left is for the designer to analyze the potential market as best he may and try to figure out what kind of plane is needed.

Unquestionably, there are thousands of would-be flyers in the country, people who would like to fly but who have refrained from doing so for some obscure reason. The problem then resolves itself into one of trying to find out what the reason is—why the planes of the present do not meet the demands of these people. It seems safe to say that, in the majority of cases, the answer is one of two things—either the plane cost too much to fly or did not seem safe enough.

It has been stated time and again and borne out by the records of the Department of Commerce, that the majority of accidents are the result of what someone once termed "pilot trouble." From this it seems safe to assume that the average private pilot is not an expert and upon consideration, this seems inevitable.

If this be true at the present, when the people who fly are a rather select group, interested in aviation and who want to learn about it, it will be true to an ever greater extent as more and more people fly.

This is true of the automobile—the average driver handles his car well enough to ordinarily avoid getting into any serious trouble, but nevertheless he is not an expert, and if the full potential market for the small plane is to be developed, it is not to be expected that the average flyer will be any more proficient than the average driver.

Most people are not going to fly as long as it is necessary to put in hours of study and unless there are some radical changes made in the present-day airplane, people will have to study or else remain rather inexpert. Therefore, it is obvious that the majority of the flyers of the future will, to put it frankly, be "dub" pilots.

The assumption on which the method of design to be developed herein will be based, then, is that the small plane of the future must be a safe economical plane for the "dub" flyer.

This dream-ship, submitted by one of our readers, illustrates several of the points discussed here.

Many engineers are working on the problem at present from the angle of a plane radically different from the present-day plane, in some respects at least.

All of the attempts to date have incorporated a new type landing-gear which will make possible, among other things, a considerably simplified landing technique. It may be that this is the only real solution to the problem, but as it is the purpose of these articles to outline a design procedure which can be used now, and their work is still in the experimental stages, it seems best to omit their efforts from the discussion.

As there are several features to be discussed here which can be applied to airplanes such as those now in the experimental stages as well as to the conventional airplane, such a course seems justifiable.

Since this airplane is to be one which can be flown by the inexperienced as well as the experienced, and is to be a ship which a person can use first as a training plane and then as a sport-plane, there are many necessary characteristics. Since any flyer who has any time to his credit at all, flies by feel, it is important that there shall be plenty of feel on the controls. The ship must respond to the controls without too much lag and yet cannot be too sensitive. It must be stable about all three axes, and yet must have sufficient maneuverability and must be easy to handle, both in the air and in landing.

It is here that the designer must make his first compromise, because the maneuverability of a plane decreases as the stability increases, and it is up to the designer to obtain a proper compromise between the two.

It was found some years ago that, for the size airplane which was most common at that time, there were certain geometric proportions for the plane which seemed to give the best all-'round characteristics. If the forces on the control stick were reasonable, the ship balanced well and the stability was good, it was thought that the proportions which gave these results were good ones.

From this, a "rule-of-thumb" calculation for the design of planes was formulated. This was all well and good for that particular size plane but, unfortunately, the engineers began to apply the formula to all airplanes, regardless of size. As a result, it became common practice to design all ships with a geometric aspect ratio of six, a tail length equal to three times the mean chord, and the center of gravity at the thirty percent point of the mean aerodynamic chord.

Obviously, as the size and speed of the airplane vary, the area of the tail surfaces and the loads on them will change. Consequently, if the proportions of the airplane are not changed, the stick forces will vary in the same general way as the size of the plane. If it were found that the proportions listed above produced stick forces which were just about right for a twenty-five hundred-pound airplane, it is obvious that these same proportions cannot produce the right forces on a plane weighing half as much.

Since the average man is not going to spend all of his time flying the same kind of plane as that in which he learned, any more than a person who learned to drive in one make of automobile would want to feel that he could not safely drive any other make, it is necessary to so design airplanes in which a change from one to another will call for the least possible readjust-

ment on the part of the pilot. And this can be done only by designing planes of various sizes so the proportions are not the same geometrically, but so the stick forces are virtually the same under all conditions. Then, the man who takes his dual instruction in a medium sized two-place plane can put in his solo time in a smaller more economical ship with the utmost safety and the least strain on his nervous system.

If planes are to be built in this manner, however, the plane should be worked out accordingly, in the original design, allowing the proportions to take care of themselves. The only alternative procedure is to try to control the stick forces after the plane is built, by changing the length of the horns in the control system. This is poor, as it limits the angular motion of the control surfaces and hence the extent of the pilot's control.

The lightplanes which have been offered in this country, and which have met with no response, have all had a few features in common, notably low power and excessively large wing area, resulting in a high ratio of wing area to engine horsepower. The low power is desirable from a standpoint of economy, and the large wing from that of a low landing speed, but if the size of the plane is not scaled down in proportion to the power, one gets merely an under-powered airplane instead of a low-powered one.

The large wing area means a large wing drag, and since these planes have been designed by the rule-of-thumb mentioned above, the correspondingly large chord means a larger fuselage and an increase in drag there also. As a result the planes have all had so low a cruising speed that, while the low power has given a low fuel consumption on an hourly basis, the consumption on a mileage basis is still high and the reduction in operating cost is but slight.

The large wing area also makes the plane highly sensitive to weather conditions, especially to gusty air, and the decrease in safety resulting from this more than offsets the gain due to the reduced landing speed.

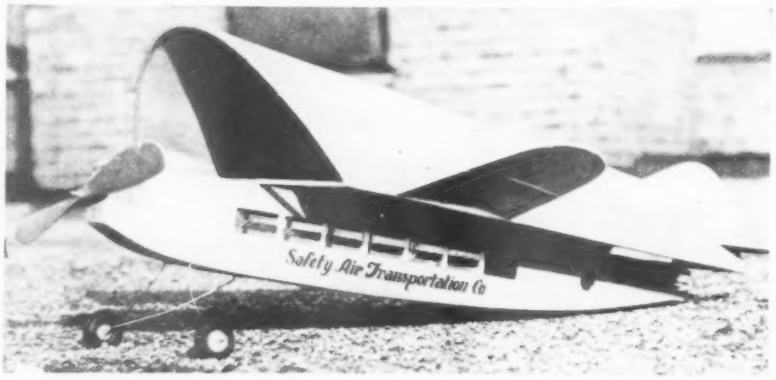
This sensitiveness to air conditions is a result chiefly of the large span of the rectangular monoplane wing, as the moment arm of the tip is so large that even a light gust is sufficient to throw the plane off its course. This situation can be helped slightly by turning to the biplane in order to reduce the span, but it must be realized that the gain is not as great as it seems at first thought.

A biplane of a given geometric aspect ratio is not as efficient as a monoplane of the same ratio, and the reduction in span is offset in part by the decreased efficiency occurring in the form of increased induced drag. This is appreciable only at low speeds, but will result in an increase in landing speed.

Just how small the difference in span

(Concluded on page 58)

Another Aspirant for the $700 Class



Here is the flivver plane in all its glory, with a poke-bonnet or scoop plane. What next?

THIS novel plane is a two-seater type which, it is said, will sell for $750 and will operate (so they say) upon a small fraction of the fuel now used for the usual type of plane. The claims for take-off and landing are equally astonishing, for according to the builders it can land or take-off within a 30-foot circle. A factory is being built in Indianapolis to turn out these planes on a mass-production basis. We hope it works out.

Why Not Use the Two-Cycle Engine?

TO the average person who thinks about such things, the two-stroke motor is always something of a mystery and the fact that this type, which at the first glance appears so simple, can also possess the fascination of an enigma makes it all the more interesting to the airplane enthusiast especially if he is contemplating building a gasoline-powered plane.

The four-stroke motor and its cycle of operations are too well known to detail them here, for this type is used in America almost without exception in motorcycles, automobiles, and aircraft, so skipping its theoretical ways and means we will accept as common knowledge the condensed explanation that its power impulses occur, in any individual cylinder, only once in every two revolutions of the crankshaft or once in every four strokes of the piston.

In the two-stroke motor the power impulses occur, in any individual cylinder, once in every revolution of the crankshaft or once in every two strokes of the piston. These are the basic differences in the two types of motors; by what arrangement of valves, timing, or supplementary cylinders this is brought about makes no difference to these distinctly different results.

No type of motor has been subjected to more experimental design than has the two-stroke. A whole book could be written explaining the wide range of complicated motors that have been built from time to time on the "every down stroke a power stroke" principle, and finally explaining how most of them failed when they departed from the guiding light of simplicity.

The survivors have developed along two extremes, heavy powerful Diesel motors and small gasoline motors. The former are out of the scope of this article so we will content ourselves with a simple description of the latter and an explanation of the gap between the two developments.

I once heard a lady friend remark that her old car only had four engines while her new one possessed six! And I did not correct her because after all her statement was quite true and I felt it was unwise to enter into an argument with a lady on such a subtle point. Later I decided that not only was her statement correct but it was also the best way to regard any multi-cylinder internal combustion motor when approaching the problem of its operation and timing.

No matter if a motor has six or sixty cylinders, it is only necessary to understand the design and functions of one cylinder to grasp the operation of the whole motor so when I describe a single two-stroke cylinder the reader will know that it can be multiplied indefinitely without altering the principle in the least.

Let us suppose first that we have before us a single cylinder four-stroke motorcycle engine and that we commence to remove some of its extremely complicated parts, first the valves, valve springs, washers and keys, then the timing case and all the clockwork it contains, cams, gears, rockers, and tappets, then we remove the heavy flywheels and turn off at least half their bulk before replacing them, then let us replace the valve caps and spark plug and consider the result of our clean-up.

We have left an extremely simple piece of mechanism, in fact it has, disregarding the ignition device, only three moving parts, the piston, the connecting

(Concluded on page 50)

High-Lights and Side-Lights

by M. A. RODDY

A little chit-chat, here and there, about the great and near great in aviation.

ACCORDING to a very reliable Washington whisper, Postmaster General James A. Farley will very shortly announce a change in rates paid to airmail operators and the surprise of the announcement will be that the change will be upward.

It is expected that this move and the recommendations which will be made by the Federal Aviation Commission will do much to stabilize an important industry.

* * *

A little bird tells us that the present arguments between Long and Harman, operators of the Amarillo-Brownsville airmail contract, and dischargd pilots is being regarded as a test case of great importance.

Long and Harman were ordered to reinstate pilots G. L. Hays and M. M. Kay and to pay them $350 back wages by November 15. The board did not reinstate Turner but decided that the company must pay him for one hundred hours of flying time at the rate of $3.50 per hour.

* * *

Our coast correspondent, commenting upon the remarkable fifteen-hour flight from Hawaii to Oakland, Calif., by Sir Charles Kingsford-Smith and his navigator Capt. P. G. Taylor, calls attention to the fact that despite the record crossing of the Pacific in fifteen hours, forty-five minutes' flying time, Sir Charles' ship is not regarded as airworthy according to Australian air recommendations.

At present the plane, Lady Southern Cross, has been attached by E. Beverly, assignee of Thomas Catton, who charges Sir Charles owed him $2,750 for services preparatory to the noted airman's historic flight from Oakland to Australia. The "flying knight," who is the first man to fly the Pacific Ocean both ways, declared the charges to be absurd.

The Captain is enroute to England preparatory to flying the first plane inaugurating a new mail service between Australia and Singapore.

* * *

Word is received from Melbourne, Australia, that Col. Roscoe Turner and Clyde Pangborn of the United States will receive $7,500 as prize money in the speed and handicap events over the 11,323-mile route of the London-to-Melbourne air race. Official announcement gives the Americans' time as ninety-two hours, fifty-five minutes and thirty-eight seconds.

* * *

A scout advises us that Geo. R. Hutchinson of "Flying-Family" fame is planning some sort of a United States to England and England to Australia race in "The American Trade Mark." By way of explanation, "The American Trade Mark" is literally a flying billboard on which Mr. Hutchinson proposes to sell advertising space.

Here is the Boeing plane that did so well in the MacRobertson London-to-Melbourne race, just before taking-off. Strange to say, it bears the word "Comet," the name of the winning ship. It was flown by Col. Roscoe Turner and Clyde Pangborn who will receive $7,500 as prize money.

* * *

Right now scheduled transoceanic flights seem to be demanding the attention of Washington and Postmaster General Farley has announced that the Post Office Department is seriously considering the letting of contracts for ocean airmail.

* * *

Dr. Hugo Eckner, distinguished commander of the Graf Zeppelin, has appeared before the Federal Aviation Commission and has outlined the feasibility of dirigible ocean service.

* * *

Pan-American Airways, with their clipper ships have announced that they are in a position to engage in ocean service. Regarding Pan-American equipment, Pilot Roy E. Keeler of the Pan-American Airways makes the interesting statement that their regular clipper equipment weighing a little over nine tons is heavier than the flagship which brought Christopher Columbus to these shores. It is also said that the Martin plane now under construction will be heavier and faster than the fifteen-ton Sikorsky recently put into operation.

* * *

Speaking of heavy equipment, our friend Seymour Berkson writes from Paris that French naval engineers have perfected a "flying battleship" equipped with torpedoes, bombs, machine guns and light cannon, and it is said that the French Ministry of Marine is planning a large squadron of these giant seaplanes.

* * *

Benny Howard, noted racing pilot and plane designer, has a competitor in none other than his twenty-two-year-old wife, Maxine, whom he taught to fly. Mrs. Howard has been shooting at a couple of Benny's speed marks. However, if she succeeds in breaking any of them the records will still be in the family. When Benny isn't bringing home the bacon at the different air races, he pilots one of the new "three-mile-a-minute" mail planes.

* * *

Happened to run across Col. Jimmie Mattern a few days ago and Jimmie allows that he is thinking about taking another crack at Wiley Post's 'round-the-world mark. Jimmie has already made two flights across the ocean only to crack up in the wilds of Russia. Jimmie also told us that "Gypsy," a little water spaniel who had crossed the continent four times by plane, visiting over forty states, had been killed by an auto in Montana.

* * *

Among the famous pilots to attend the Aviators' Post dinner, held at the Ritz-Carlton Hotel in New York, were Dean Smith, well-known airmail pilot and holder of the Distinguished Flying Cross as a result of his work with the original Admiral Byrd's Antarctic Expedition; Clarence Chamberlin; Frank Hawks; Frank Courtney; Frank Godwin; Bob Lyons; Lieut. Col. George Vaughn; Roger Q. Williams; Roger Kahn; Casey Jones; Elliott White Springs; Clayton Knight; Clark Robinson; Sam Moore; and Major Law-

XUM

rence Brower. Fred Stone, the actor, who is also a pilot, directed the show following the dinner.

* * *

Pilot Howard C. Stark, noted blind-flying instructor, who developed the one-two-three plan which was used extensively for blind-flying instruction, takes issue with the Department of Commerce in the adaption of the present Army Air Corps method for blind landing.

Stark has been flying since 1921 and has just returned to Chicago from Europe where he spent seven months as blind-flying instructor for the Royal Dutch Airlines of Amsterdam. Besides being the first of the blind-flying instructors Pilot Stark has the distinction of taking the first cow aloft when in September, 1925, he flew a young calf to the Dutchess County Fair in New York. Thus, ruining the old story that, "It's a good thing cows don't fly."

* * *

Amelia Earhart, famous woman flyer and holder of the West-East speed flight record of 19 hours 4 minutes for women, is making an automobile trip across the country and is at this writing in Los Angeles having driven from New York.

* * *

Another prominent pilot who is getting ready for his vacation trip is Harry Ash, pilot for Sen. William Gibbs McAdoo, who was recently unanimously elected president of the National Aeronautic Association. Harry is planning a trip around the world.

* * *

The speed title of the world goes to the "crazy boy" of Italian aviation, Lieut. Francesco Agello, 32, who flew through space at the rate of 440 miles an hour. However, American commercial pilots are stepping along at a good clip as attested by the recent record runs made by Pilot Melvin Fried flying from Minneapolis to Chicago in one hour and twenty-two minutes which was followed by a flight to New York by Pilots Bryan and Munger in three hours and ten minutes.

* * *

Plans are also under way for Captain Eddie Rickenbacker to take off in a superairliner in an effort to break his present trans-continental record of thirteen hours and two minutes.

* * *

Pilot Eddie Hamilton, our Washington correspondent, tells us that the navy is "up in the air" making daily flights testing the direction of the wind for hay fever victims. Haa choo!

* * *

We have an exclusive rumor to the effect that Geo. Vest, chief of the local Department of Commerce Area, is making an investigation concerning a certain independent operator. We have also another exclusive rumor which may develop into a story that all is not well with Eugene Vidal, Director of Air Commerce, and there is a subordinate gunning for his job.

END

Measuring the Ceiling

Measuring altitude with a pilot balloon and theodolite.

LATELY we have received several requests from our readers requesting information on how the ceiling or height of the clouds is determined, by the use of a pilot balloon.

Here we see the meteorologist about to take a reading with an instrument called a "theodolite," an instrument greatly resembling a surveyor's transit.

By means of the theodolite, the angle of the sight-line with the horizon is read from the graduated bezel, which by triangulation, will give the height of the pilot balloon when it just disappears in the clouds.

Spars Carry Gasoline

A REMARKABLE and unusual weight-saving method has been recently adopted by the Blackburn Aircraft manufacturers of England. Their new product is the "Meteor," an all-metal craft powered by a "Cheetah."

A form of single spar wing is worthy of note. The spar itself is of all duralumin tube construction, suitably stiffened and supported and tapering from the full thickness of the wing to practically a point at the tip. But here is the remarkable feature of this spar.

Due to the fact that the spar can be closed with bulkheads, it is used as fuel tanks, the added weight of the bulkheads is barely noticeable. Wonder why the fuselage longerons cannot be used for the same purpose?

An Open Letter to the Bureau

Mr. John B. Rathbun,
Managing Editor,
POPULAR AVIATION.

Dear Sir:

Perhaps you can tell me what a man is to do in the face of the following conditions:

The Department of Commerce has been changing Aeronautics Bulletin 7-A almost constantly for the past year. The first revision came out last September, to become effective on the first of January. In April another tentative bulletin appeared, to be effective July 1. Before this date, however, another revised draft appeared, and the date of effectiveness was put forward. The last two sets of revisions contained many minor changes, but the basic load conditions, and the methods of figuring the loads were the same as in the requirements which went into effect last January.

In August the department issued a memorandum stating that the new requirements would be effective on October 1, but saying nothing of any further revisions of major importance. Finally, on October 29, I received a copy of the new bulletin, which had already been in effect for four weeks, to find that the definitions of the basic flight conditions had been changed, and with them the methods of figuring the loads. Bulletin 26, the supplement to Bulletin 7-A, which is necessary in order to be able to proceed with an analysis, has not been issued yet.

Of course, I realize that such a proceeding as this is common practice among the political powers that be in Washington, but it causes the man who is trying to get somewhere in aviation a great deal of inconvenience, as well as costing him a lot of money. Having heard nothing from the department even intimating any major changes in the requirements by the date on which they were to become effective, I concluded that none were being made, and proceeded on a stress analysis. As a result I have a full month's work which I can throw in the waste basket, and to the time lost in this manner I can add the past two weeks spent waiting for the department to issue the rest of the necessary data.

Perhaps this is part of the President's plan to keep men at work—and I admit that if the department continues with this policy, so that every analysis has to be done two or three times, it will probably be quite effective—but I cannot see how it is going to help get the industry back on its feet, and it is decidedly expensive for the men affected.

As I said at the start of the letter, perhaps you can tell me what a man can do in such a situation—I'm sure that I don't know.

Sincerely,

AN AERONAUTICAL ENGINEER

American Aces Receive Medals

by CARL B. OGILVIE

The following list of American wartime air heroes who received medals from our government, is the first of a series of such biographies prepared by the author. These sketches are authentic, being taken direct from the records of the U.S. War Department.

LLOYD A. HAMILTON

Residence—Pittsfield, Mass. Born —Troy, N. Y. General Order No. 20, W. D., 1919. At Varssenaere, Belgium. Aug. 13, 1918. First Lieutenant, 17th Aero Squadron, Air Service.

LEADING a low bombing attack on a German aerodrome 30 miles behind the lines, he destroyed the hangars on the north side of the aerodrome and then attacked a row of enemy machines, flying as low as 20 feet from the ground, despite intense machine-gun fire and setting fire to three of the Hun planes. He then turned and fired bursts through the windows of the chateau in which the German pilots were quartered, 26 of whom were afterwards reported killed.

Posthumously awarded. Medal presented to father, Rev. John A. Hamilton.

* * *

CHESTER E. WRIGHT

Residence—Brookline, Mass. Born —Readville, Mass. General Order No. 15, W. D., 1919. Near Beffu, France. Oct. 10, 1918. First Lieutenant, Pilot, 93rd Aero Squadron, Air Service.

HE attacked an enemy observation balloon protected by four enemy planes and, despite numerical superiority, he forced the planes to withdraw and destroyed the enemy balloon.

Oak-leaf cluster. A bronze oak leaf, for extraordinary heroism in action near Bantheville, France, Oct. 23, 1918. Accompanied by one other machine, he attacked and sent down in flames an enemy plane (Fokker type) that was attacking an allied plane.

He was in turn attacked by three enemy planes. His companion was forced to withdraw on account of motor trouble. He continued the combat and succeeded in bringing down one of the enemy planes and forcing the remaining two into their own territory.

* * *

PAUL FRANK BAER

Residence and born—Fort Wayne, Indiana. General Order No. 128, W. D., 1918. Northeast of Reims, France. Mar. 11 and 16, 1918. First Lieutenant, Pilot, 103rd Aero Squadron, Air Service.

ON March 11, 1918, he attacked, alone, a group of seven enemy pursuit machines, destroying one, which fell near the French lines northeast of Reims, France.

On March 16, 1918, he attacked two enemy two-seaters, one of which fell in flames in approximately the same region.

To the attack! A SPAD making a quick take-off in response to a challenge from the enemy squadron overhead. This shows, without doubt, a SPAD could climb at a sharp angle directly after take-off.

Oak-leaf cluster. He was awarded a bronze oak leaf for the following acts of extraordinary heroism in action: He brought down enemy planes on April 5, 12, and 23, 1918; on May 8, 1918, he destroyed two German machines; and on May 21, 1918, he destroyed his eighth enemy plane.

* * *

WILLIAM P. ERWIN

Residence—Chicago, Ill. Born— Ryan, Okla. General Order No. 70, W. D., 1919. In the Chateau Thierry and St. Mihiel salients, France. June and July, 1918; Sept. 12 to 15, 1918. First Lieutenant, 1st Aero Squadron, Air Service.

LIEUTENANT ERWIN, with Second Lieutenant Byrne E. Baucom, observer, by a long period of faithful and heroic operations, set an inspiring example of courage and devotion to duty to his entire squadron.

Throughout the Chateau Thierry actions, in June and July, 1918, he flew under the worst weather conditions and successfully carried out his missions in the face of heavy odds. In the St. Mihiel sector, Sept. 12 to 15, 1918, he repeated his previous courageous work. He flew as low as 50 feet from the ground behind the enemy's lines, harassing German troops with machine-gun fire and subjecting himself to attack from ground batteries, machine guns, and rifles. He twice drove off enemy planes which were attempting to destroy an American observation balloon.

On September 12 and 13, 1918, he flew at extremely low altitudes and carried out infantry contact patrols successfully. Again, on September 12, he attacked a German battery, forced the crew to abandon it, shot off of his horse a German officer who was trying to escape, drove the cannoneers to their dugouts, and kept them there until the infantry could come up and capture them.

Oak-leaf cluster. For the following act of extraordinary heroism in action near Sedan, France, November 5, 1918, Lieutenant Erwin was awarded an oak-leaf cluster to be worn with his Distinguished Service Cross: Against the advice of experienced officers, he undertook a reconnaissance flight in the face of atmospheric conditions that rendered flying most dangerous.

In order that his observer might gain the necessary information, he was forced to fly at a perilously low altitude and was subjected to continuous anti-aircraft and rifle fire. When information gained on the flight had been dropped at division headquarters, he circled and returned over the enemy lines, although on the first reconnaissance mission his plane had been repeatedly hit by bullets.

(Concluded on page 48)

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Two New Dream-Ships Entered

Here are the praiseworthy designs entered by two young lads, ages 14 and 15 years respectively, who are undoubtedly destined to become leading aeronautical engineers.

TO judge from the mass of dream-ships that has been tumbling in during the past month, none of our dream-ship customers are suffering from insomnia. What visions have been pounding through the brains resting on the pillows!

First of all, at the head of the column, is the product of Hume Peabody. This is intended as an escort ship for our modern high-speed bombardment ships. The designer is only 15 years old but has lived in the Air Corps all his life. His dad is a Major in the Air Corps and has been flying since 1917. He lives at 3700 Massachusetts Ave., Washington, D. C. This is a nice-looking job, Hume, and we hope that you will continue on with this sort of work.

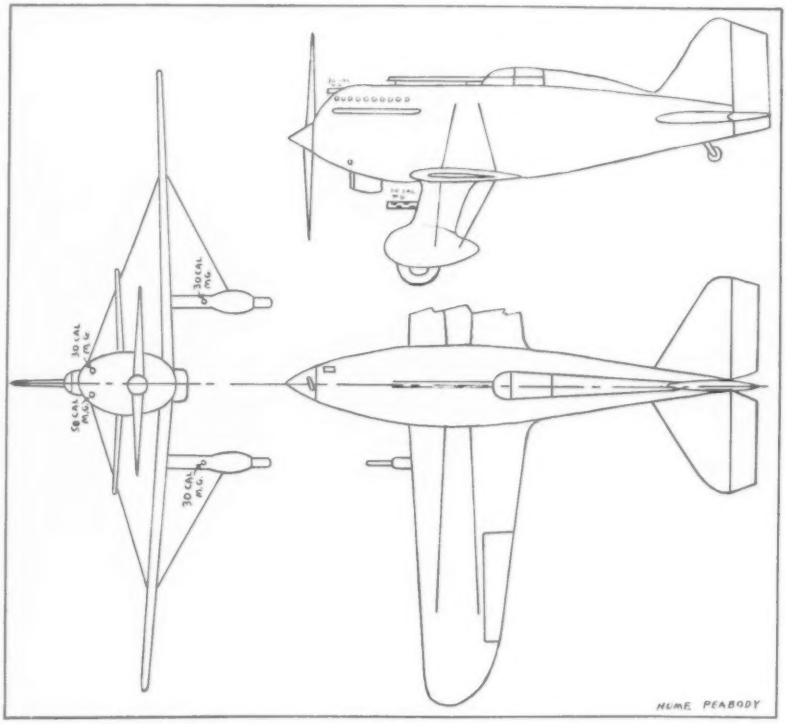
And Hume has not contented himself simply with the details of the plane itself for he has also specified the armament as will be seen, with guns in the boots as well as in the nose of the fuselage. However, there is one omission that he made and that is, he did not close in the remaining member or members of the wing bracing system.

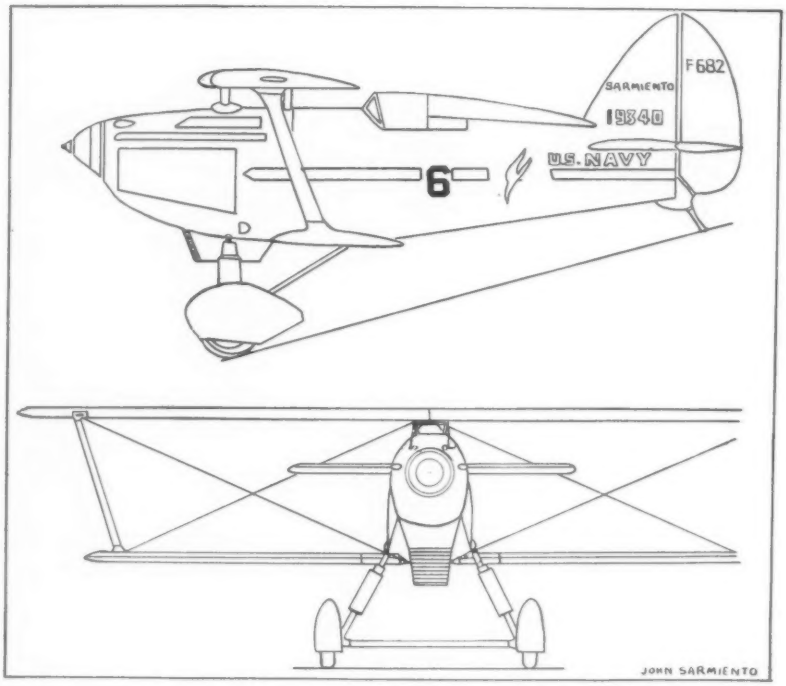
There should be additional lift wires running between the landing-wheel struts (in the plane of the axle), or else from each landing-gear strut to the fuselage bottom. This is necessary for the completion of the "polygon of forces."

But, in general, the job is very well done indeed, and worthy of a junior Boeing or Curtiss. We are glad to see that he prefers liquid-cooled engines for a job like this instead of the conventional radial which has been hung on everything from a powered glider to a transcontinental freight-train.

John Sarmiento, 120 Carolina St., Vallejo, Calif., is 14 years old and is taking an elementary course in airplane designing at the Junior High School. His dream is parallel with the Hawker Super-Fury although he tried to be original. Equipped with a 500 h.p. Curtiss Conqueror engine, John expects it to have a top of 220 m.p.h. and a landing speed of 55 m.p.h. Very good—a nifty ship.

He has stuck (or adhered) to British practice in more than one respect. First in the use of a good substantial axle with external shock-absorbers. Second in the use of staggered biplane wings. Third in the use of an inverted in-line engine, liquid cooled. However, we believe that the inter-plane struts could be moved toward the body instead of being so close to the tips, thus reducing stresses on the flying wires.





Above is the drawing submitted by Hume Peabody, while below is the entry of John Sarmiento. Both excellent drawings for boys aged 15 and 14 years respectively.

All About the Corben Super-Ace

by O. G. CORBEN

The builder of this fine little Ford-powered ship tells of its construction. The editor of P.A. inspected the Super-Ace after its splendid cross-country flight from Madison, Wis., to Chicago, Ill. It is everything claimed by Mr. Corben, and a lot besides.

I WILL put a few drops of oil on the old Underwood and get busy giving you all the dope on this new little sport plane which has just been flight-tested here at Madison, Wisconsin.

Last month, POPULAR AVIATION ran the story on the Corben conversion of the Model "A" Ford motor, giving you the dope on this new power-plant. Since that story went to press, we have made several flight tests of our new job to be known as the "Corben Super-Ace," powered with the converted Model "A" motor, and I can assure you that it certainly has lived up to its name in every detail.

This little ship gave me the surprise of my life the first time I gave her the gun for her first venture into the ozone. When you get into a new ship for a test flight you are expecting most anything to happen. While you have carefully worked everything out on paper and according to this and that it should be okay, but to date I have never felt quite sure just how things were going to turn out on the first flight.

It was a beautiful fall day when the Super-Ace was rolled out of the shop and her tanks filled with gas for the first time, oil was put in and the radiator filled. After fixing a few leaks in the cooling system, the motor was warmed up and she reved up 1,650 r.p.m. on the ground. This is not what we expected but the propeller was a little too large in diameter.

The little job sure looked trim sitting out on the field, tugging at the blocks as if it were anxious to get into the air. I had been waiting for the time to come so I could see for myself just how the motor would do its stuff in the air, so I decided to try and get it off of the ground, even if it were not turning up 1,800 r.p.m. and this is when the surprise came.

I taxied down the field and turned around for the start, the wind was out of the south and it was necessary to make a cross-wind take-off. I no sooner gave the old Ford the gas than the ship leaped forward and away she went down the field, rolling along just as important as though a brand new Hornet was pulling her.

It did not seem any time until I was able to pull her off and into a nice climb. Up she went to 1,000 feet in nothing flat. You can imagine how I felt, for the old motor was doing its stuff in great fashion, sitting up ahead purring like a kitten with its stomach full of warm milk.

I leveled the ship off and opened the engine wide, the tachometer showed just 1,900 r.p.m. This lacked 200 r.p.m. of what we planned to turn it but the airspeed showed almost 100 m.p.h. I sat back in the seat and relaxed for the first time since we started to build this new job, for it was doing as much as we had anticipated, even if it was not turning up within 200 r.p.m. of what had been figured. I knew that we could get the desired revs by cutting down the diameter of the propeller about two inches, which would give the propeller a 6′ 2″ diameter with a 4′ pitch.

The trim little Ford-motored Corben Super-Ace looks like a pursuit job and is not far from performing like one. And, best of all, it has real flying ability as well as good looks.

Next, the ship was put through several maneuvers and all controls responded very nicely. The ship proved to be stable enough so, all in all, things were going better than expected.

The first test was brought to a premature close when the header-tank started steaming like a peanut wagon. However a landing was not made for several minutes although the temperature gauge showed well over 212 degrees Fahrenheit, for I wanted to see just what would happen. A pretty stream of white steam was rolling over the top of the wing and if I had been any good at spelling I could have easily done a swell job of sky writing. After the first test, a larger radiator was installed and this worked out fine for the motor now runs at a temperature of 160 degrees on the average day and on a cold day a portion of the radiator must be covered to keep the temperature up to the point where the motor operates efficiently.

To date, the Super-Ace has been flown well over twenty hours, several cross-country trips have been made, the ship being in the air for a period of two hours at a time and as yet we have not had to make even the slightest adjustment on the engine. The motor runs very smooth and with less vibration than the average aircraft motor. The actual gas consumption, cruising the motor at 1,700 r.p.m., is only four gallons per hour. No doubt this will be much less when smaller jets are used in the carburetor as the engine is now running a little too rich. Five quarts of oil were put in the motor on the first flight and after flying over twenty hours the oil was drained and lacked only a pint of being five quarts, which proves that these motors are very economical on oil.

After flying the engine for the abovementioned time, I became somewhat uneasy and began to wonder just how things were going on the inside of old Henry, so the motor was completely torn down and given a thorough inspection and we found everything in as good condition as the day it was put together. The motor was put back in the plane and is behaving much better than the best of lightplane motors.

Naturally, you are interested in the new plane powered with this engine, so I will give you some data on it. The accompanying photographs will show you at a glance, the racy lines of the Super-Ace. It is a semi-high-wing monoplane, well streamlined. You will note that the engine is completely cowled in. An aluminum spinner on the propeller carries out the speedy lines. The cowl runs back from the engine and connects the wings to the fuselage. A windshield finishes off the rear end of the cowl. A headrest picks up the lines of the front cowl and tapers off into the fin.

The landing-gear is the same as used on the Corben Junior- and Baby-Ace. Spring type shock struts take up the shock of hard landings. The landing-gear is faired and fabric covered. Two gas tanks of five gallons each are located in the wings, with a shut-off valve for each tank mounted on the dash. The wings are of spruce construction, braced inside with tie-rods, and they

are fabric covered. The fuselage, tail group, landing-gear and wing struts are of welded steel tubing construction, fabric covered. The motor mount is welded onto the fuselage.

Special cast aluminum wheels of our own design are standard equipment on the Super-Ace, however 700x4" or 16x-7x3" airwheels may be used with very little change in the landing-gear.

The cockpit is large and roomy and while it may appear that this ship would have a blind spot, it is not so, for it really has good visibility. One has excellent vision off to either side under the wing or by slightly moving your head back you can look above and ahead over the wing, by looking out of the side you can see around the front of the engine with no trouble at all.

The controls are standard with the stick and rudder pedals, controls are geared down so the action is just the same as it would be in a larger ship.

During the numerous test flights this little job showed no tendency to be tricky or hard to handle. Students with a limited amount of solo time have flown the ship as well as any pilot of long experience.

SPECIFICATIONS

Wing span.....27 ft.
Height.....79 in.
Length.....220 in.
Weight, empty.....596 lbs.

(Concluded on page 60)

Freedom Still Reigns in the State of Oregon

Eight unlicensed lightplanes lined up at Beaverton, Ore. They have flown for three years without having an accident of any kind. State Authorities, please look them over.

OREGON, always noted as being one of the few states that give the amateur pilot and homebuilder a break, is still open to the amateur as the accompanying photo shows.

Here we see a line-up of eight lightplanes at a private field at Beaverton, Ore. Not one ship in the group has a Federal license, three are identified factory jobs and the remaining five are homemade. This is going some because the town of Beaverton has a population of only one thousand and there are mighty few towns of ten times that figure that can show anything like this.

These ships have flown practically every day for three years without having a single accident of any kind. This is what big business is trying to stop, and we wish to thank Lester Long, chairman of the Amateur Aircraft League, for this photo and story.

We hope that this little story and photo comes to the attention of state officials who have enacted laws against lightplanes in their states.

GLOSSARY OF WORDS, TERMS AND PHRASES—DIC-A-37

Ballast-condenser. A device for condensing and liquefying the moisture in the exhaust of airship engines. The moisture thus collected compensates for the loss of fuel, tending to maintain the airship at a constant altitude regardless of the amount of fuel consumed.

Ballast (Hydrolith). A compound known as "Hydrolith" liberates hydrogen gas when contacted with water. The gas, thus obtained, is conducted to the balloon, causing extra lift while the residue of the Hydrolith is discharged like ballast. This substance, therefore, performs a dual service in maintaining the lift of an airship or balloon.

Ballast-thrower. A device for throwing ballast out of a balloon or airship.

Ballonet. (1) A small gas-bag or balloon. (2) A small bag placed within the envelope of a balloon or airship which is filled with air under pressure so that the outer envelope will maintain its proper form. (3) One of several gas-bags placed within the envelope of an airship, the bags being filled with hydrogen or helium produce lift. Maintaining the gas in independent ballonets is an added safety factor in the Zeppelin airships.

Ballon-Sonde'. A sounding balloon for meteorological measurements in the atmosphere.

Balloonet (Balloonette). Obsolete. See BALLONET.

Balloon. A lighter-than-air craft which is sustained in the air by filling a bag with a gas lighter than air. Such gases are hydrogen, helium, or coal gas. The lift is equal to the difference between the weight of air displaced and the weight of the gas according to the principle of Archimedes. The balloon is also known as an AEROSTAT.

Balloon (Captive). A balloon restrained by means of a rope or cable which can be controlled from the ground by a winch.

Balloon-cloth. (Fabric.) The cloth of which the envelope of a balloon is made. It is gas-tight and is generally a rubberized cotton fabric or a cotton fabric lined with gold-beater's skin.

Balloon Cloud. A cumulus or alto-cumulus cloud of spherical shape having the appearance of a balloon.

GLOSSARY OF WORDS, TERMS AND PHRASES—DIC-A-38

Balloon (Dirigible). A steerable balloon provided with power.

Balloon-envelope. The outer skin or gas-containing bag of a balloon.

Balloon-farm. A field or enclosed space occupied by a number of balloons.

Balloon (Free). An unconfined balloon, free to float in the atmosphere without control or restraint from earth.

Balloon-gases. Lighter-than-air gases used for producing buoyancy in a balloon or airship. Such gases are hydrogen, helium or coal gas.

Balloon (Hot-air). A balloon in which buoyancy is obtained by the use of heated air instead of by hydrogen or helium gas. The density of heated air, being less than that of the surrounding atmosphere, causes a proportional buoyancy. It is also known as a MONTGOLFIER BALLOON from the name of its inventor.

Balloon (Kite). A captive cylindrical shaped balloon, flown with the bag inclined to the wind. Support is thus gained, both by the buoyancy of the gas within the bag and by the impact of the wind on the inclined surface of the envelope.

Balloon (Spherical). A balloon having an envelope of spherical form as distinguished from the ovoid form.

Balloonist. (Obsolete). See AIRNAUT.

Balsa. A very light wood obtained from South America. Used for the construction of airplane models and for the fairings of large aircraft. Balsa wood is structurally weaker than spruce but is much lighter in weight.

Banana-Oil. A lacquer or varnish made by dissolving celluloid or gun-cotton in amyl-acetate. Used as a protective surface for highly polished metals, as a vehicle for aluminum and bronze paints and for "doping" airplane models.

Band (Drip). A skirt or narrow horizontal band of fabric around the lower part of a balloon to collect condensed moisture on the bag and discharge it so that the water will not drip into the basket.

New Ice Sled Powered by Outboard Motor

This is a view of the new Mead ice sled which is powered by an outboard marine motor, using an air propeller.

AS a result of the enthusiastic response by sportsmen to the "Cyclone" Motor Sled, Mead Gliders, Chicago, announce the new model, "Whirlwind," powered by any outboard motor.

This new "Whirlwind" Outboard Motor Sled is carefully designed to permit the installation of any type outboard motor without any difficulty whatever, and embodies the use of a specially designed cooling system. Only a few minutes are required to install an outboard motor in the sled, or for replacement on boat for water use.

The Mead Motor Sled opens a new field of winter sport to all outboard owners including motorcycle owners. Streamlining of the sled itself has been perfected so that the utmost in beauty and efficiency is obtained.

Speeds of forty to eighty miles an hour may be expected according to the power of the motor used. A special feature of both "Cyclone" and "Whirlwind" ice sleds is the fact that they may be easily assembled at home from drawings, parts or complete construction kits. Details may be secured by addressing Mead Gliders, 12 South Market, Dept. 1-E, Chicago.

Propellers Are Vital

LITTLE attention has been paid by amateurs to the propeller problem until they finally were compelled to study the prop in order to obtain the performance they expected.

In the first place all of the engine power is transmitted to the air through the propeller. If the propeller is not efficient in transmitting this power, then there is just so much loss in propulsive power. And, the trouble is not always in the blade alone but it may be due to surrounding objects that divert the air-stream and prevent the propeller from working under the proper conditions.

"It's Your Move"—in a New Air Game

by LARRY LESH

MENTAL alertness is a quality absolutely necessary to airplane pilots, particularly those with ambitions to fly Army or Navy planes. Games and sports of all kinds develop this alertness and are often recommended to students whose air work appears slow.

With this in mind, the writer has devoted some time and study to the development of simple games played somewhat in the manner of checkers and chess but with a decided aviation flavor since the "men" are airplanes imagined to be equipped with machine guns shooting forward and the moves correspond to the maneuvers of airplanes.

This type of game indirectly tests the players' ability to solve problems such as are met in flying; to recognize and evade critical situations; to identify airplane silhouettes and markings and to develop strategic power and ingenuity. The game is illustrated and described in its simplest form as a "vest pocket" edition, using two airplanes for each player but may be expanded, of course, to a squadron of airplanes on each side played on a large board divided in squares.

When developed on a large map board, with the addition of fixed pieces, representing anti-aircraft guns or zones, the airplanes are divided into pursuit, attack, and bombing divisions, the real strategy of air war comes into play.

The simple rules for playing the game as a "dog-fight," with two airplanes for each player are illustrated by the diagram showing the moves permitted.

Planes allowed one move at a time which may be one square as indicated or one quarter turn. Note that "D" is free to turn.

In the situation shown:

A threatens B—B may slide left.
B threatens A—A may slide right.
C threatens A—A may slide right.

Airplanes start from opposite corners on marked squares.

If B slides to right, D will take on next move and threaten C. C may slide to right.

As a variation of the standard rules described, the game may be played in a way suggesting the problem of blind flying. Turns in blind flying call for accurate plans and timing to complete desired maneuvers. For similar training the airplane game may be played on a progressive system of "stepping up" the number of moves for each play.

For example, A makes one move, B makes two moves. A makes three

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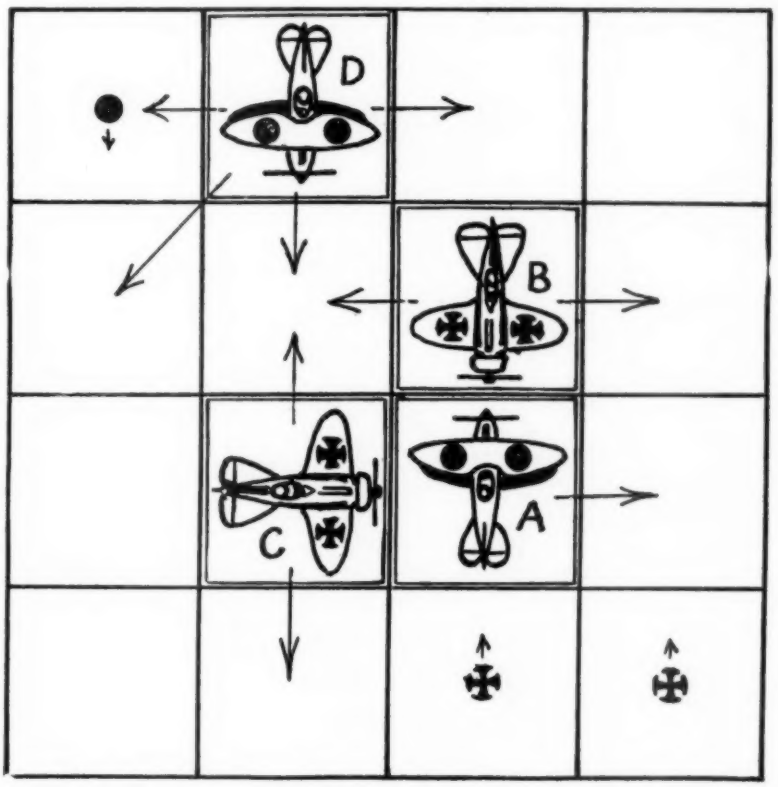


This is a layout of the new air game devised by Mr. Lesh. Try it out for yourself—it's great fun—but don't try to make copies—it is copyrighted.

The Bristol Fighter

(see front cover)

THE Bristol fighter was a well regarded ship at the time that we entered the war, 1917. In fact it was so well thought of by the Allied forces, that the old U.S.A. got the job of building more of them, including the engine.

It was very fast for its time, a good climber and very maneuverable. It could give a good account of itself in any kind of a scrap and, in short, was the British version of the SPAD. It was powered with various engines on the English built ships . . . but . . .

We ran into a nice problem on this side and one that cost us plenty of money. It was for this ship that we built the first Liberty engine, a "Vee" type 8-cylinder job that was supposed to contribute plenty of m.p.h. to the Bristol. But by the time that the drawings were made, the tools and jigs turned out, etc., the Bristol Fighter became out of date and we got all of this junk back on our hands without having it even tried out!

And so, all dressed up with 8-cylinder Liberty motors and nowhere to go with them, the same general design was worked over into the well known 12-cylinder Liberty which was extensively used on all sorts of planes—even after the war.

Wallace McDowell Builds a Five-foot Model

A front view of the gasoline-driven model built by Wallace McDowell.

THIS gasoline engine-driven model was constructed by Wallace McDowell, Los Angeles, Calif. It has a wing span of 5 feet, a length of 4 feet, and weighs 3½ pounds. It has a gasoline tank capacity for a 12-minute flight and has a flying speed of 25 m.p.h.

We hope that some of our readers, who have built gasoline-engine propelled models, will write to us and send a photo of the job.

GLOSSARY OF WORDS, TERMS AND PHRASES—DIC-A-39

Bank. (1) A mass of clouds. (2) To incline or tilt the wings of an airplane laterally, one wing tip higher than the other, to avoid skidding in making a turn. (3) An assembly of engine cylinders in a row, "cylinder bank."

Bank-and-Turn Indicator. An instrument for determining the proper amount of bank to give an airplane in making a turn.

Bank (Angle of). See ANGLE OF ROLL.

Banked-turn. A turn made with an airplane in which the wings are tilted laterally so as to resist the tendency toward outward skidding. By this means a greater wing area is presented to the air horizontally so that the area resists the centrifugal force tending toward skidding. To roll about longitudinal axis.

Bar (abbrev.). BAROMETER.

Bar. (1) A meteorological unit for the measurement of atmospheric pressure. It is equal to a force of one dyne per square centimeter. (2) A rod.

Barber. A strong cutting wind loaded with ice particles or frozen fog.

Baric. Pertaining to the pressure of the atmosphere.

Baric Law. The relation of the wind direction to the isobars.

Baric Wind-rose. A radial or rosette form chart that shows the frequency of winds blowing from different directions and the average barometric pressures during this time.

Barnstormer. A roving exhibition pilot—a free lance.

Barogram. A record or chart made by a BAROGRAPH.

Barograph. An instrument that indicates atmospheric pressures on a chart in respect to time. Such an instrument gives a complete record of the altitudes attained by aircraft during a flight. Usually carried during attempts at record breaking.

Barometer. A meteorological instrument for indicating the atmospheric pressure. Used in weather forecasting and for measuring altitudes according to atmospheric pressure variations. It is made in two types, the ANEROID and the MERCURY type barometers.

Barometer (Aneroid). A barometer of the pressure-gauge type. The indicating hand is connected through a multiplying linkage to a flexible diaphragm on an exhausted box. Pressure variations cause flexing of the diaphragm which in turn move the indicator. The word "aneroid" means "dry."

GLOSSARY OF WORDS, TERMS AND PHRASES—DIC-A-40

Barometer (Mercurial). The old type of barometer in which the atmospheric pressure variations are indicated by the height of a mercury column in a glass tube. A high column indicates a high pressure.

Barometer Corrections. Barometers as received from the maker are adjusted to sea-level pressure. When used at any other altitude, they must be readjusted to the new conditions. Usually, corrections for temperature are also necessary, particularly with mercury barometers.

Barometric-pressure. The atmosphere presses down on the earth at sea-level with an average pressure of 14.7 pounds per square-inch. This is sufficient to support a mercury column of 760 millimeters or 29.92 inches in height. There is some variation due to weather conditions and a direct variation with increasing altitude.

Barometric-readings. Barometers are graduated to read in terms of mercury column. This may be in inches or millimeters. Thus, the figure 29.85 on a barometer scale means that the atmospheric pressure is sufficient to support 29.85 inches of mercury. If the metric scale is used, then a figure such as 762.4 indicates that many millimeters of mercury supported by the pressure.

Barometric-velocity. The velocity of air as determined by the barometric-pressure acting on the air. The difference in pressure between two points determines the velocity.

Barometric Weather Forecasts. When used as a means of forecasting weather conditions, the barometer is not highly accurate. However, the approach of a violent storm can usually be predicted several hours in advance by the sudden change in the barometric pressure.

Baroscope. See BAROMETER.

Bartholomew's Atlas. A very complete book of charts showing the distribution of rainfall.

Barothermograph. An instrument that simultaneously records the pressure and the temperature of the atmosphere.

Barothermohydrograph. An exploring instrument that simultaneously records the pressure, temperature and humidity of the atmosphere.

Barothermometer. See BAROTHERMOGRAPH.

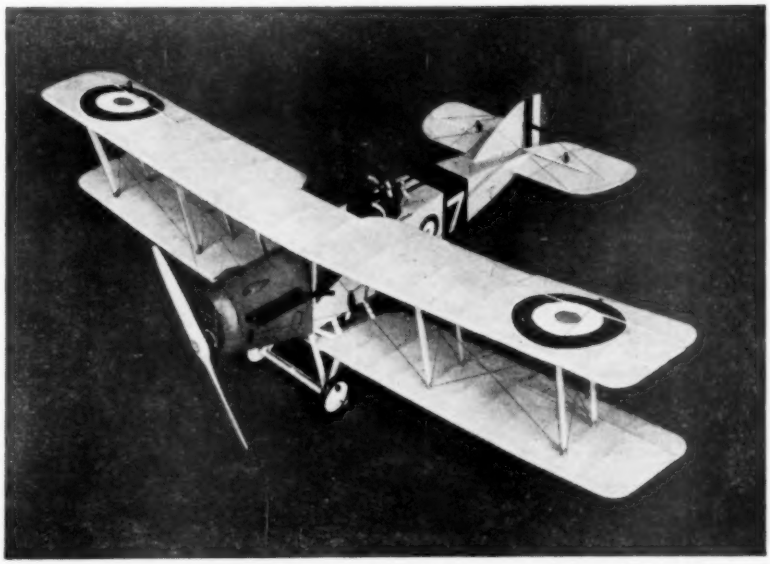
Barrel (cylinder). The cylindrical portion of an engine cylinder.

Barrel (feather.) The quill of a bird's feather.

Barrel (oil).

Building the Bristol Fighter

by
PAUL W. LINDBERG
Model editor and designer for
POPULAR AVIATION



It's hard to tell whether you are looking at a model or the real wartime Bristol Fighter.

WE have had a great number of requests for plans of popular wartime models. The Bristol Fighter shown here is a trim little model with very fine flying qualities.

The shock-absorbing axle and tail-skid eliminate damage to the ship when landing. All control surfaces are movable with aluminum hinges. These and many other excellent features developed by our laboratory, make the Bristol Fighter F2B a very interesting model to construct.

All dimensions can be quickly and accurately determined by placing a ruler on the part to be measured. The plan is printed full size. If you wish a larger model, multiply this measurement by the amount of increase.

COLOR SCHEME

Nose cowl to cockpit, red. Fuselage, wings, elevator and rudder, yellow. All struts natural wood color with three coats of clear dope. Details black.

CONSTRUCTION OF FUSELAGE

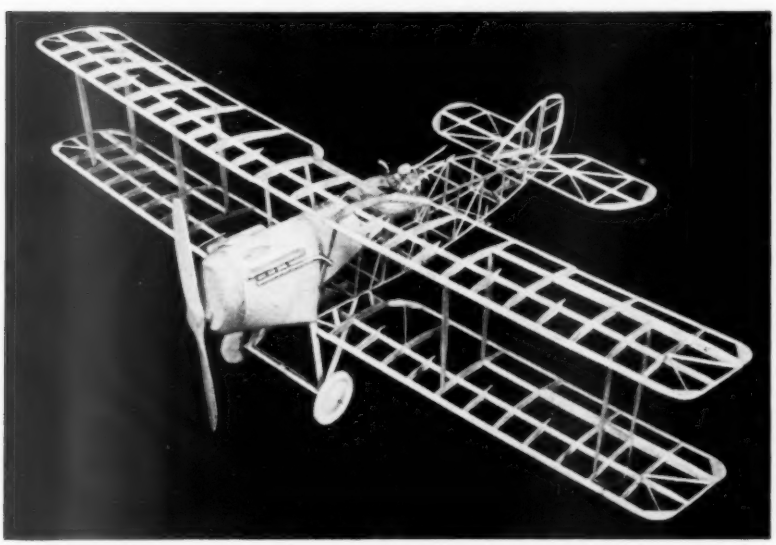
The fuselage sides are built from 1/16-inch square balsa. The longerons, verticals, diagonal braces, etc., are held in place until securely cemented, by inserting straight pins on either side of strips wherever needed, having first placed waxed paper on top of plan to prevent parts from sticking to plan.

After the two sides are completed, the cross members are cemented into their proper locations. Check carefully from front to rear for alignment.

Cut the formers from 1/32-inch sheet balsa and cement in their respective positions as shown on plan. Two stringers are required, one at the top of the body, the other at the bottom of body.

Properly carve and shape nose block to form radiator and cement to front of fuselage.

The stiff paper motor cowling may be applied next. Cover from nose block to F-1 joining at bottom. Now cover from F-1 to F-2.



The uncovered framework of the Bristol Fighter model shows a simple sturdy construction.

LANDING-GEAR

Select a strong grade of balsa in constructing the landing-gear struts. Cut slots in front struts to permit the shock absorbing axle to move up and down freely.

CONSTRUCTION OF WINGS

Cut all ribs from 1/32-inch sheet balsa. Pin center spar in position on the plan, now cement ribs in their proper locations. The leading and trailing edges are now cut and sanded to shape and cemented to front and rear ribs.

Center section panels, top and bottom, are of the same size. Make wing tips as shown on plan of 1/16-inch balsa. We recommend this type of wing tip, as it is far simpler to construct and neater in appearance.

ELEVATOR AND RUDDER

Construct these upon the plan and cover with tissue before assembling to body.

COVERING THE MODEL

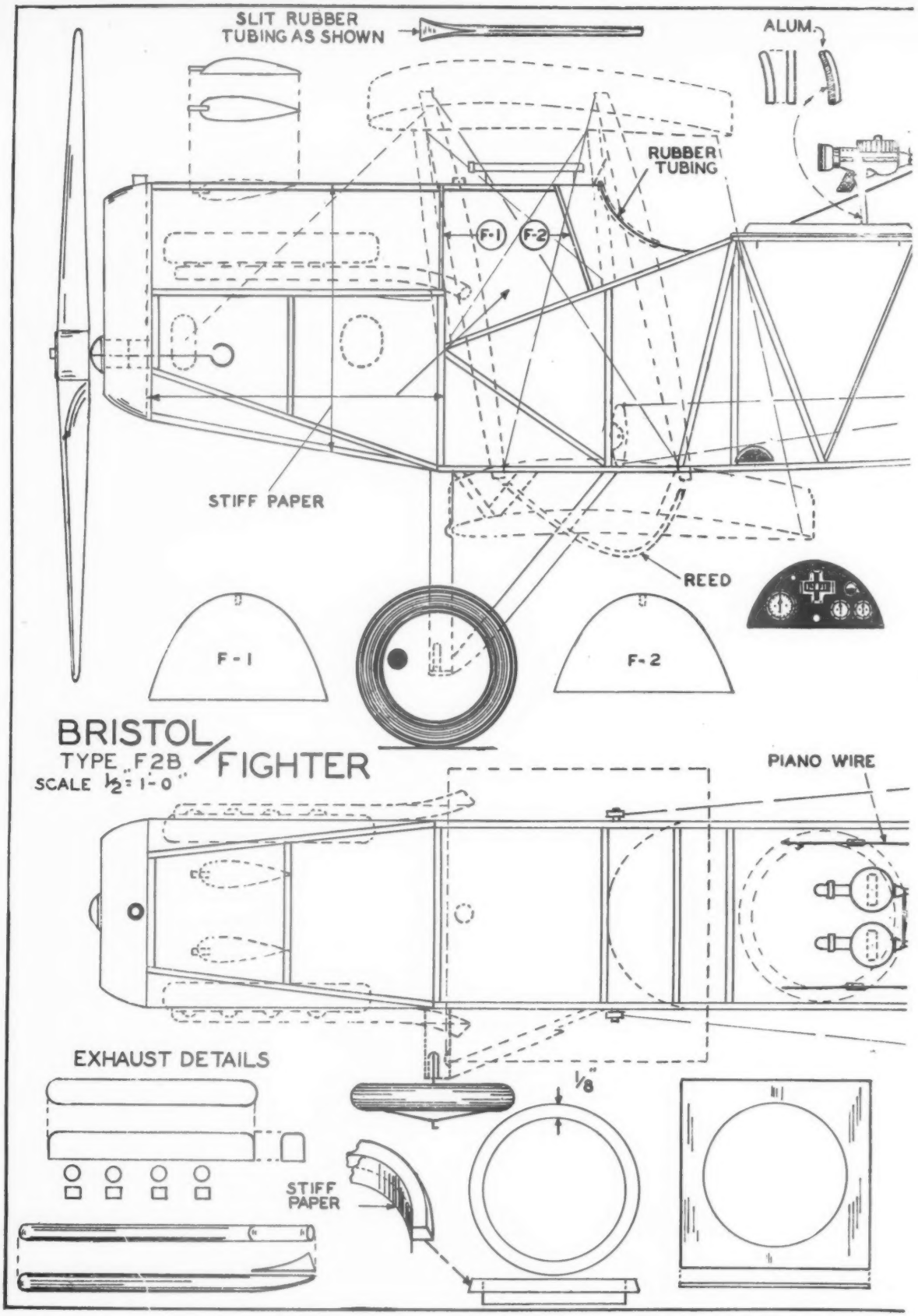
Apply tissue to the various framework members, using a light grade of model airplane dope to fasten it to the outer edges. Stretch tissue as tightly as possible to remove all wrinkles. When all edges have dried apply coat of water to tissue.

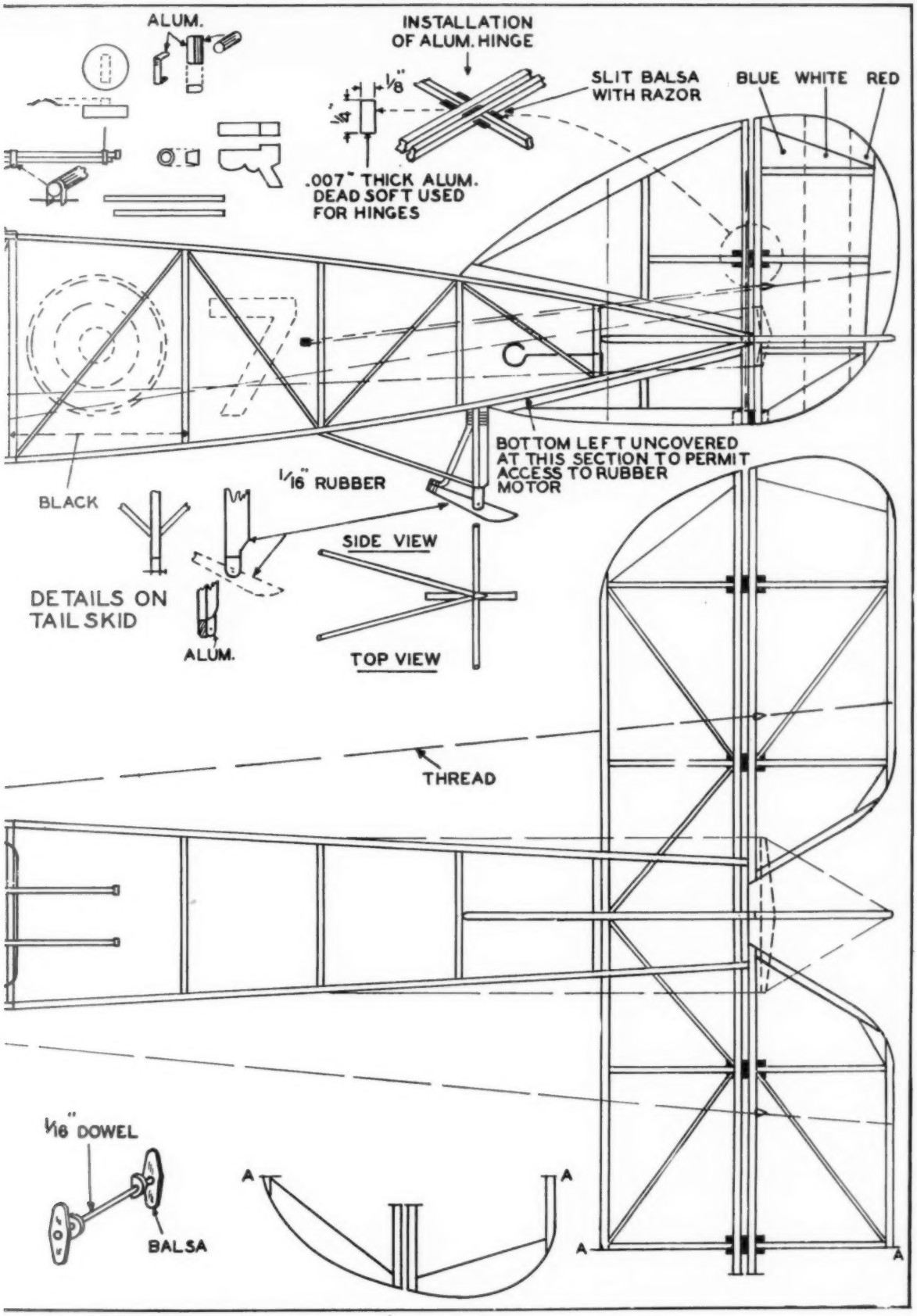
When all water has dried completely, tissue will become taut. It is a very good idea to pin wings, elevator and such surfaces upon a flat surface to keep from warping. A coat of clear dope may next be applied to all surfaces. Now apply colored dopes.

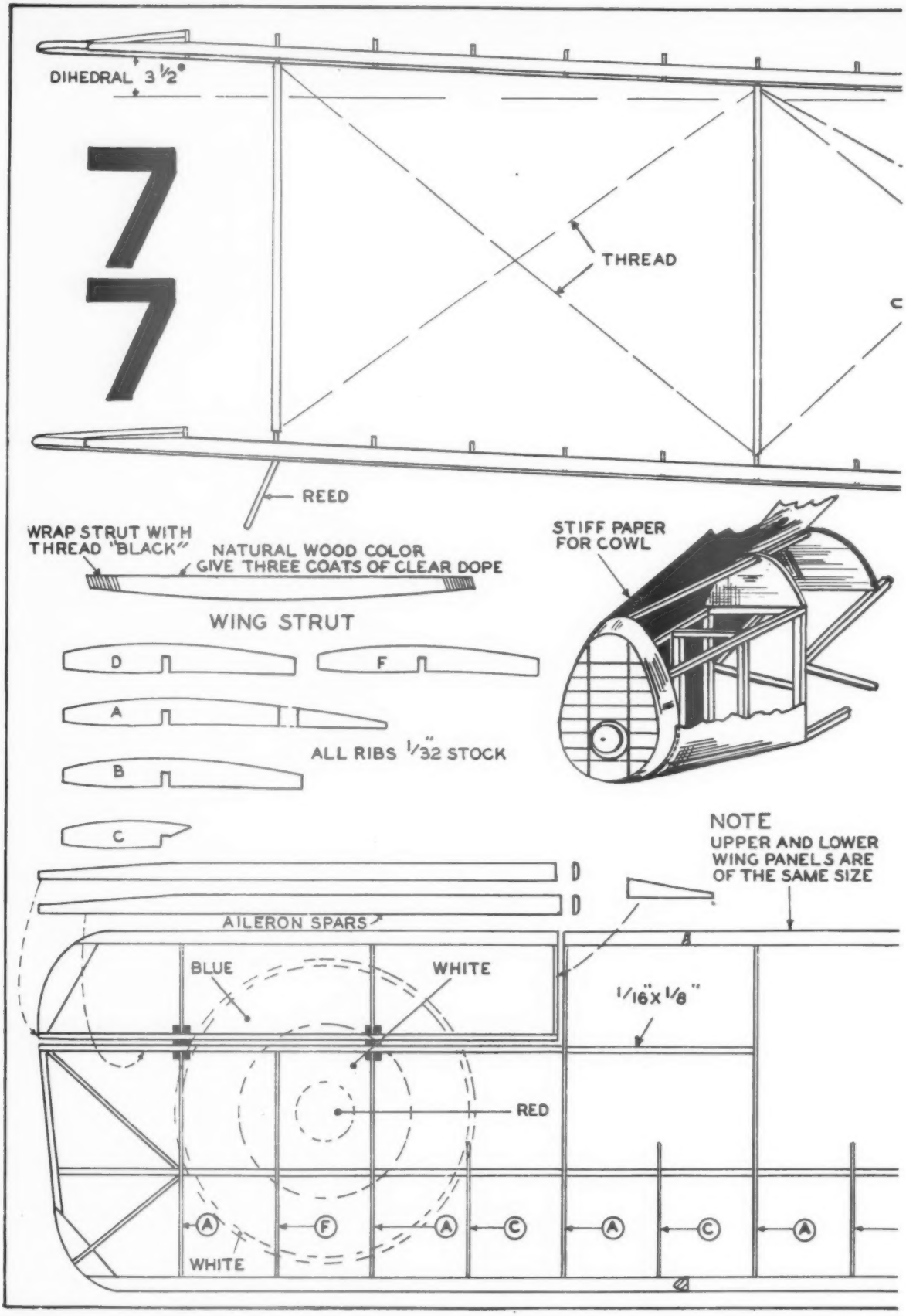
ASSEMBLY

Cut tissue at rear of fuselage to re-

(Concluded on page 65)


SLIT RUBBER TUBING AS SHOWN
ALUM.
RUBBER TUBING
F-1
F-2
STIFF PAPER
REED
F-1
F-2
BRISTOL
TYPE F2B FIGHTER
SCALE ½" = 1'-0"
PIANO WIRE
EXHAUST DETAILS
STIFF PAPER
1/8"


ALUM.
INSTALLATION OF ALUM. HINGE
1/8"
SLIT BALSA WITH RAZOR
BLUE
WHITE
RED
.007" THICK ALUM. DEAD SOFT USED FOR HINGES
BOTTOM LEFT UNCOVERED AT THIS SECTION TO PERMIT ACCESS TO RUBBER MOTOR
1/16" RUBBER
BLACK
SIDE VIEW
DETAILS ON TAIL SKID
ALUM.
TOP VIEW
THREAD
1/16" DOWEL
BALSA
A
A
A
A


DIHEDRAL 3½°
7
7
THREAD
C
REED
WRAP STRUT WITH THREAD "BLACK"
NATURAL WOOD COLOR
GIVE THREE COATS OF CLEAR DOPE
WING STRUT
STIFF PAPER FOR COWL
D
F
A
ALL RIBS 1/32" STOCK
B
C
NOTE
UPPER AND LOWER WING PANELS ARE OF THE SAME SIZE
D
D
AILERON SPARS
BLUE
WHITE
1/16"X1/8"
RED
A
F
A
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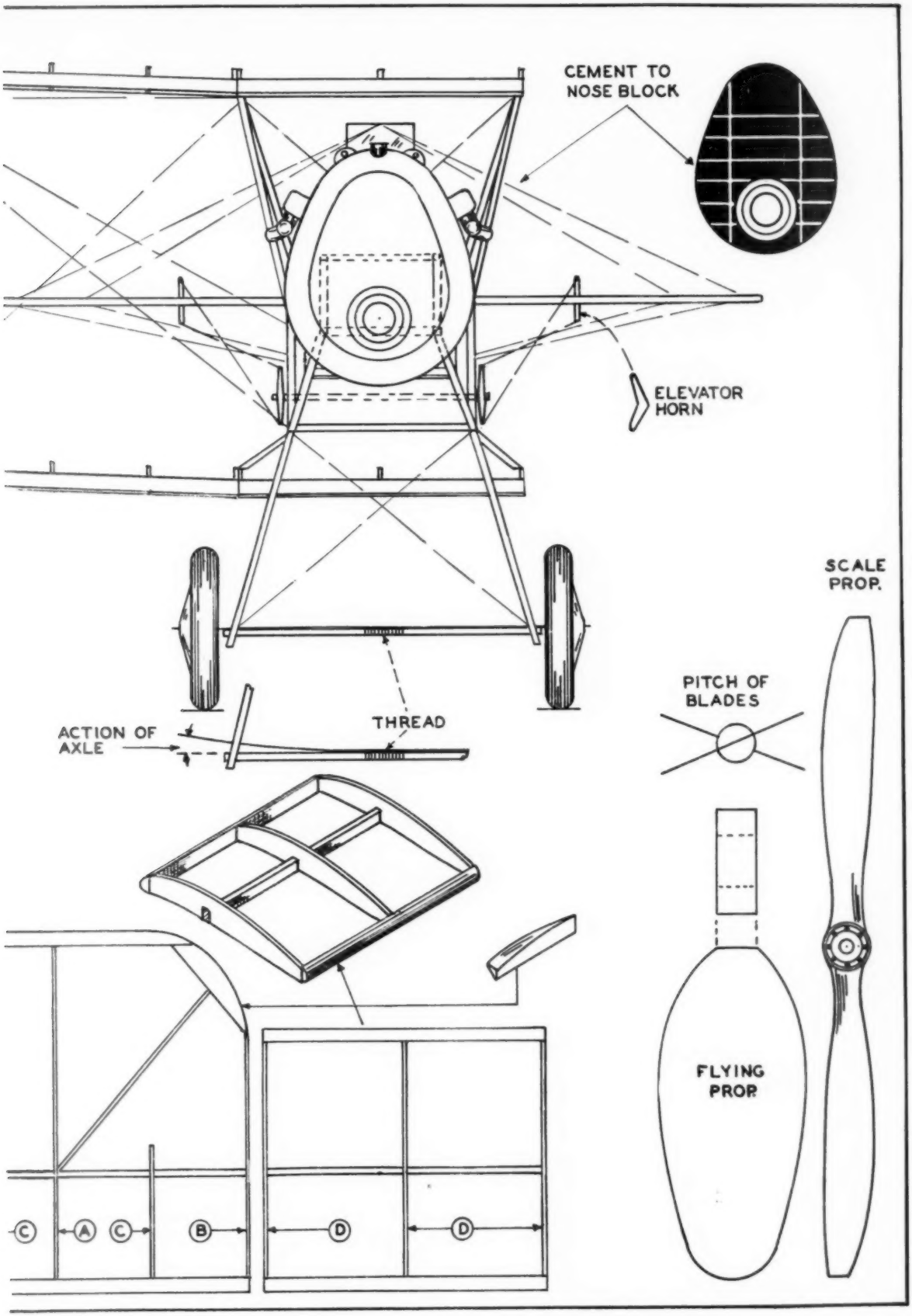
A
C
A
WHITE


CEMENT TO
NOSE BLOCK
ELEVATOR
HORN
SCALE
PROP.
PITCH OF
BLADES
THREAD
ACTION OF
AXLE
FLYING
PROP
C
A
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B
D
D

What the Industry is Doing

Latest bulletins from the airplane, engine, equipment manufacturers and dealers boiled down into a nutshell. Contributions to this department are invited.

GENERAL AIR LINES, successor to Western Air Express, is to purchase four 205 m.p.h. luxury liners for equipment on its San Diego-Los Angeles-Las Vegas-Salt Lake City airline. The present flying time of six hours, 45 minutes, will be slashed 71 percent, to three hours, 55 minutes. The four planes and 710 h.p. Curtiss-Wright Cyclone engines will cost $326,820. The new Douglas ships will replace the Fokker multi-motor ships now in use.

E. E. PORTERFIELD, JR., former president of the American Eagle Aircraft Corporation, is again entering the aircraft industry as the head of the Porterfield Aircraft Corporation, Kansas City, Mo. The new concern is to build a new light-plane known as the "Flyabout," a fine cabin type plane. The new ship was designed by Noel R. Hockaday.

THERE IS much activity in electric lighting circles due to the changes recently permitted for border and airport lights by the Bureau of Air Commerce. The new order greatly simplifies and reduces the cost of airport lighting and the new equipment under development reflects this condition.

AT LEAST two new in-line air-cooled inverted engines are to be placed on the market. One is a 50 h.p. engine in the low-priced field while the other is a 150 h.p. six-cylinder job for sport-planes. Looks as if we were getting away from the radial engine idea by leaps and bounds.

O. G. CORBEN, Madison Airport, Madison, Wis., has his new Ford-powered plane performing all sorts of acrobatics and has flown it with great satisfaction on several long cross-country trips. The new converted Ford is standing up well under the most stringent tests, and Mr. Corben is getting all ready to attack the A.T.C. problem with the Bureau of Air Commerce.

THE NEW Model "D" Waco, built by the Waco Aircraft Company, Troy, Ohio, is the latest addition to the Waco Military ships. A description of this new plane will be found elsewhere in this issue.

A NEW Douglas land-transport plane of the Pan-American Airways was loaded at Brownsville, Texas, recently for a take-off to the West Coast of South America, where with three others, it will operate on U.S. Foreign Air Mail route from the Panama Canal Zone, through Colombia, Ecuador, Peru, and Chile to Argentina and Uruguay on the East Coast. One of the planes covered the 1,700 miles between Cristobal and Lima, Peru, in the actual flying time of 8 hours, 45 minutes. Some of the Fords that they will replace will be used for local service, while others will be used for transporting machinery into mountainous destinations.

A THREE-DAY flying schedule from California to the Orient will become a fact according to announcements made recently by the Pan-American-Grace Airways. The phenomenal success of the Pan-American "Clipper Ships" is said to make this possible.

TEN Boeing transports, type 247-D, are being delivered to United Airlines while three are to be shipped to Luft Hansa.

A SHARP increase in aircraft production is reported by the Aeronautical Chamber of Commerce of America. A new monthly high for this year was reached in the deliveries of commercial engines which were up 46.5 percent from June.

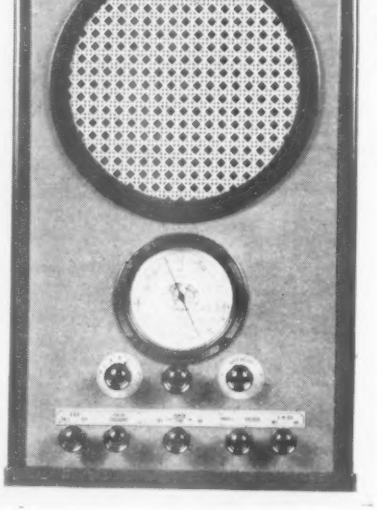
THE ALEXANDER MILBURN COMPANY, Baltimore, Md., have just issued a new catalogue full of real information for those interested in oxy-acetylene apparatus, paint-spray equipment, and portable carbide lamps. This company will be glad to send these catalogues on request, which will be full of interest to welders and others engaged in aircraft manufacture.

RCA-VICTOR Company, Inc., Camden, New Jersey, have recently added to their line of airline radio equipment. This line comprises transmitters and receivers both of the ground and aircraft type. Prominent among the new radio receivers is the Model AVR-5A General Purpose Radio which replaces the earlier AVR-5 Airport Radio Traffic Control Receiver. It has a range of 16.6 to 2,000 meters, covering the amateur band up to the airways beacon transmissions.

BOEING SCHOOL of Aeronautics, Oakland, Calif., announces the sixth Annual W. E. Boeing Scholarships. The awards for 1935 consist of a $5,800 Boeing Airline Pilot and Operations Course, as first prize, and the Boeing Airline Technician and Amateur Pilot Course valued at $1,000 for the second prize. To be eligible for competition, the candidate must be a male student in good standing and in regular attendance at some university, college or junior college in the United States or Canada. Special and part-time students are not eligible. The age must be between 18 and 25 years in good physical condition. The candidate is to submit a treatise of not more than 2,000 words on any aeronautical subject. Address Boeing School of Aeronautics, Oakland, Calif., for questionnaires, etc.

CONSOLIDATED net loss of The Aviation Corporation and its subsidiary companies for the nine-month period ending September 30, 1934, was $1,711,757 compared with a profit of $395,819 for the same period of 1933. Mail revenue for 1934 amounted to $1,052,332 compared with $3,-743,060 for the same period in 1933.

THE AUTOGIRO is demonstrating its fitness for mosquito control work. Its ability to settle down slowly into small areas and spray an unbroken film of oil on stagnant ponds makes the autogiro particularly fitted for this work. Demonstrations were made in view of the leading entomologists of the country who are intensely interested in insect extermination.



Front view of the RCA-VICTOR Model AVR-5A All-Purpose radio receiver which has a wave-band coverage of 16.6 to 2,000 meters, ranging from the amateur band up to the airways beacon transmissions.

A. P. TALIAFERRO, Jr., and Company, Inc., 101 Park Ave., planned the 450,000 Rhode Island State Airport, Providence, R. I. Contracts were awarded to the Lane Construction Company, Meriden, Conn. The plans call for a concrete apron and three concrete runways 3,000' x 150'. The design marks a definite step forward in the drainage of airports which prevents side drainage and yet permits control in summer so that immediate drainage of the field is avoided, allowing water to soak into the grass.

NORTH AMERICA AVIATION, INC., and wholly owned subsidiaries, report a net loss of $744,846.52 in the first nine months of 1934, deducting depreciation charges but before including a profit of $1,199,941.92 realized from the sale of securities. Including the latter, a net profit of $455,-095.40 is shown.

PARKS AIR COLLEGE, E. St. Louis, Ill., has an extensive background after seven years of operation. More than 47,000 hours have been flown at this school, 1,385 planes have been repaired and 1,202 men have been graduated. This means nearly 5,000,000 miles of student flying with a safety record that is surprisingly good. Parks Air College operates the Federal Licensed Repair Depot No. 14, and this depot is the laboratory for instruction in mechanics and some phases of engineering.

RECENTLY, a record shipment of 1,004 pounds of electrotypes was received at the Glendale, Calif., Airport. The transcontinental charges averaged $1 per pound.

F. L. BENSON, an executive of the Enna Jettick Shoe Company, made a transcontinental flight via TWA with a pair of special shoes to be worn in a movie picture by Judith Allen, featured film player.

DOLORES Del Rio, Ramon Navarro, and other film stars attended the opening of the new National Theater in Mexico City. When Miss Del Rio returned to California, she said, "I think I should be very jealous of your new Electra Lockheed transport, for the Mexicans who were formerly so kind to me had now only eyes for the plane."

PYLE NATIONAL HEADLIGHT CO., Chicago, Ill., has a very busy plant. They are turning out a great many navigation lamps and are in the midst of developing a 5-horsepower Diesel engine for various applications of light and power in small units. Their navigation lights are well known and well liked by all manufacturers.

A NEW air-conditioning plant for transport planes is about to be placed on the market by a Chicago, Ill., concern that seems to be about the last word in air-conditioners. More will be said about this simple light equipment when it is in production. It eliminates carbon monoxide automatically, no matter where the gas may originate, it is equipped with personal thermostatic controls that localize the heat and has various other features of importance.

THE NEW airmail contracts seem to be raising havoc with the airmail carriers, judging from the reports coming into this office. Deficits ranging from $15,000 to $2,000,000 are encountered in almost all financial reports.

THE LUBO-METER, an instrument for quickly testing the condition and quality of lubricating oils, is now in an advanced stage of development and is nearly ready for the market. It is nearly as precise as a laboratory instrument and is infinitely faster. The offices of the Lubo-Meter Company are located in the Conway Building, Chicago, Ill., and they will be glad to issue informative literature upon the testing of oils to all officials in the operating departments of airlines.

CLEAROSOL is the name of a new lubricating oil made by the Socony-Vacuum Oil Company. It is a petroleum product refined by an entirely new process and is particularly well adapted to aviation engines and other mechanisms where oil meets with strenuous treatment. By a process of washing, the greater part of the non-lubricants are removed from the oil, leaving only stable heat and friction resisting hydrocarbon bodies.

THE MACROBERTSON race brought the attention of the world to the superior construction of American passenger transport planes. The Douglas ships entered in the races played to crowded hangars for the time that the ships were in London. All of the American ships and the American personnel brought praise from the English press.

HAMMOND AIRCRAFT COMPANY, Ypsilanti, Mich., was awarded the contract for 25 Bureau of Air Commerce planes for the use of the Bureau's inspectors and officials. This will be known as the Model "Y" Hammond and is a low-wing three-wheel pusher type that savors somewhat of the old Curtiss tripod architecture.

A PORTABLE electric crane, known as the model CYE, is adapted to airplane overhauls. It is built by the Baker-Rauling Company, Cleveland, Ohio, and is sold with several boom lengths covering radii from 8 feet to 19 feet.

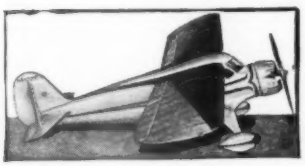
WASHERS adapted to the aviation industry and available in both AN-960 and AN-970 specifications, are produced by the Wrought Washer Mfg. Company, Milwaukee, Wis. They can be had in any metal, steel, stainless steel, wrought iron, tinned steel, brass, copper and aluminum. A comprehensive catalogue on washers has just been issued by this company.

A NEW Eclipse propeller hub is now being offered by the Eclipse Aviation Corporation, East Orange, N. J. This is a fully automatic variable pitch hub. The pitch is varied by differences in the air pressure or thrust reaction, and sets itself to the most advantageous angle for various conditions of flight.

NATIONAL MOTOR BEARING COMPANY, 1100 78th Ave., Oakland, Calif., has developed the Type BB Seal for use as an oil retainer for any rotating shaft. It is said to hold oil perfectly as well as grease or other fluids. It is well adapted to high-speed supercharger shafts.

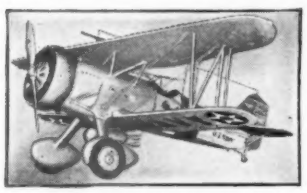
Here's the PLANE YOU'VE been waiting for

THE *New*, FAMOUS SUPER-DETAIL *Martin Bomber*



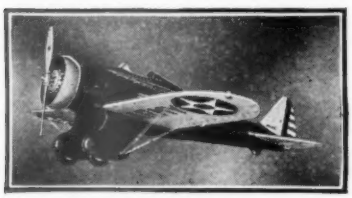
STINSON RELIANT

Wingspan 32 5/16", length 21¼", weight 3½ oz., exact ¾" scale. Here's a plane you'll be mighty proud to own and fly. An exact reproduction of one of the latest 4 passenger cabin planes. You'll find more unusual and different features in this plane than in any other. For example—adjustable speed arresters built into the wings, the movable cabin doors, the complete interior with four seats and control column, and all the other Super-Detail features. Colored in bright contrasting yellow and black.
Kit complete, postpaid..... $2.50



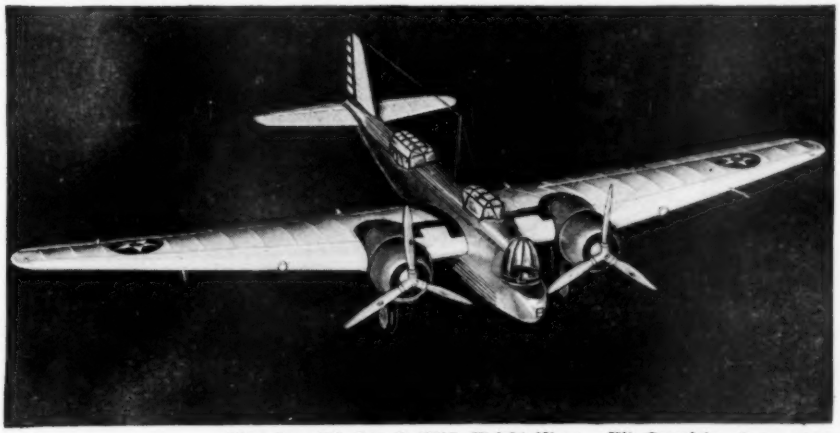
CURTISS GOSHAWK

Wingspan 23⅜", length 16¾", weight 3⅝ oz., exact ¾" scale. You've heard of this beautiful Curtiss Goshawk. Now you can build your own with the most complete kit you ever saw. This snappy little Navy fighter has many more details than you can see in the photo. Everything designed in exact scale of course. Streamlined drag ring specially designed; two detachable blade propellers, and the entire model coated with the new IDEAL high lustre finish, with silver, yellow, red and black coloring. Plenty of material is furnished.
Kit complete, postpaid..... $2.00



BOEING P-26A

Wingspan 21¼", length 18", weight 2½ oz. Exact ¾" scale. One of the newest, most advanced of all fighting planes. Fast, speedy, with full armament capable of over 240 miles per hour. This flying model is an exact replica of the famous fighter—one that is identical in all but size with its noteworthy big brother. Beautifully colored in olive drab and yellow. All Super-Detail parts included.
Kit complete, postpaid..... $1.75



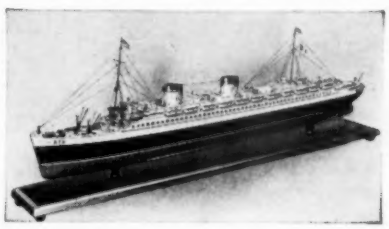
Wing Span 35"—Length 22½"—Weight 4⅝ oz. Kit Complete $3.50

IDEAL brings to you, with all the Super-Detail features and many new exclusive fittings, this famous big, powerful, mystery ship of the army. Beautifully designed, strikingly colored in high luster Olive Drab and Yellow, the Martin Bomber plane has more new and beautiful features than any model you ever saw—one of the most complete flying models ever built.

In addition to the controls which you can actually work from the cockpit—which operate elevator, rudder and ailerons just like the big planes, the Martin Bomber has retractable landing gear, rotating gun turret, movable machine guns, special streamline cowlings, two types of 3 bladed propellers—one for flying and one for exhibition with removable motor sticks for flying; rudder and elevator balanced surfaces; new type freese ailerons—all in all one of the finest, most complete flying models ever built at any price.

Designed by experienced flyers—men who have spent their lives designing and building real planes, IDEAL Super-Detail planes have all the features of their big flying brothers. Also the new and exclusive Super-Detail fittings such as—ailerons, rudder and elevator can be set in any position desired for flying and controlled by cables from cabin—IDEAL bright high luster finish—pulleys—control horns—control cable—streamline drag rings—exact scale wood wheels—everything an exact duplicate of the big flying planes.

Another NEW Super-Detail model . . . the Italian liner *REX*.



29"—scale 1/32" to the foot.

An exact replica of the new and beautiful Italian liner . . . this Super-Detail 29 inch model has a shaved hull and over 100 metal fittings. 24 cast metal lifeboats; 24 cast stairways, 2 cast anchors; 4 metal propellers; 6 cast bits; 48 metal davits. The Rex comes in beautiful high luster original colors of black, orange, white, red and green; and the kit also contains turned wood parts, printed wood, cement, wood filler, sandpaper, etc. It has full sized plans with complete instructions and 7 photographs illustrating the different stages of construction. A beautiful model, easy to build, for all the hard work has been done for you. **Kit complete, postpaid.... $6.00**

***That is why you really learn the principles of aviation when you build planes the IDEAL way . . .* that is why they are exact reproductions, perfect in every detail, why experienced model builders prefer Super-Detail kits. That is why IDEAL received serial number one and was the first to be approved by the Junior Birdmen of America.**

Send the coupon today for any of the kits pictured. Everything necessary to build a big, beautiful, workmanlike flying job, included in the Super-Detail kit. You only have to follow the complete and simple instructions to obtain extraordinary results.

WHAT THE SUPER-DETAIL KIT INCLUDES:

Everything necessary to build a big, beautiful workmanlike job is included in the Super-Detail Kit. Finest materials only are used in its construction: Sheets of selected plainly printed balsa, strips of various sizes, etc., sheets of silk tissues, cement, both colored and plain dope, propeller shafts, two propellers, motor plate, rubber motor, wheels, cable cord and all other hooks, pulleys, control hinges, eyelets, washers, sand paper, celluloid, reed, wire and other small but necessary things to make the complete model exactly in accordance with the plans and instructions.

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2" Double Action 15c

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Something New
1" dia., 9 cyl. 30c
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Swivel Joint Fork and Axle
⅛ up to ⅝" wheel 10c
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Postage 3c Pair—on Rubber Tired Wheels, 4c Pair

PROPELLERS

Hawk Type

2-bladed	3-bladed
3¼".....25c	4".....35c
4".....30c	4½".....45c
4½".....35c	5".....50c
5".....35c	5½".....60c
5½".....40c	6".....70c
6".....40c	7".....80c
7".....55c	8".....90c
8".....65c	9"....$1.00
9".....75c	10"....1.10
10".....85c	11"....1.25

Standard

2-bladed	3-bladed
1½".....10c	1½".....15c
2".....15c	2½".....20c
3¼".....20c	4".....30c
4".....25c	4½".....40c
5".....30c	6".....50c
5½".....35c	7".....70c
6".....40c	8".....80c
6½".....45c	9".....90c
6¾".....50c	10"....$1.00

Props can be had up to 24 in. dia. Postage 6c each.

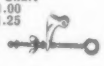
Adjustable Pitch Aluminum Propeller

Suitable for Flying Models

2-bladed
8" dia. 35c
10" dia. 50c

3-bladed with Shaft
9" dia. $1.00
11" dia. 1.25

Special Shaft & Hangar
Threaded shaft with soldered arc flange....20c



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24 ARMY.....25c Set
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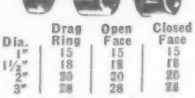
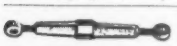


Dia.	Drag Ring	Open Face	Closed Face
1"	15	15	15
1½"	18	18	18
2"	20	20	20
3"	28	28	28

Postage 6c



WORKING BRASS TURNED

Take-up	Toggled Long	Plain End
½"	⅝"...25c	30c
¾"	⅞"...30c	35c
1"	1¼"...30c	35c
1½"	1¾"...50c	55c

Dummy Turnbuckles
¼".....10c each
⅜".....10c each
½".....10c each

PEDESTAL BASE

Black lacquered base for your scale models from 10" to 24" wing span.....75c

Model Knife

Collapsible Blade
2" blade.....18c

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SHEAVES

Pulley Wheels or Sheaves made of brass, grooved to carry control wires, etc. 3/32" or ⅛"..3 for 10c 3/16" or 5/16" with bearing...4c ea., 4 for 15c

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SELLEY MFG. CO., INC., Dept. 401
1373 GATES AVENUE, BROOKLYN, N. Y.

Decorations

(Continued from page 35)

Penetrating far into enemy territory, he maneuvered most skillfully and, with shells bursting near him, flew low while his observer poured deadly fire upon machine-gun nests that had been holding up the advance of our troops. When his machine was crippled by enemy fire he displayed exceptional skill in effecting a landing upon rocky land within the enemy lines. With his observer, he beat off repeated enemy attacks and fought his way back to the American lines with information of vital importance to our troops.

* * *

FRANK O'D. HUNTER

Residence and born — Savannah, Ga. General Order No. 147, W. D., 1918. In the region of Ypres, Belgium. June 2, 1918. First Lieutenant, Pilot, 103rd Aero Squadron, Air Service.

LIEUTENANT HUNTER, while on patrol, alone attacked two enemy biplanes, destroying one and forcing the other to retire. In the course of the combat he was wounded in the forehead. Despite his injuries he succeeded in returning his damaged plane to his own aerodrome.

Oak-leaf clusters (four). A bronze oak leaf for extraordinary heroism in action in the region of Champey, France, September 13, 1918. He, accompanied by one other plane, attacked an enemy patrol of six planes. Despite numerical superiority and in a decisive combat, he destroyed one enemy plane and, with the aid of his companion, forced the others within their own lines.

A bronze oak leaf for extraordinary heroism in action near Verneville, France, September 17, 1918. Leading a patrol of three planes, he attacked an enemy formation of eight planes. Although outnumbered, they succeeded in bringing down four of the enemy. Lieutenant Hunter accounted for two.

A bronze oak leaf for extraordinary heroism in action in the region of Linydevant-Dun, France, October 4, 1918. While separated from his patrol he observed an Allied patrol of seven planes (Breguets) hard pressed by an enemy formation of 10 planes (Fokker type).

He attacked two of the enemy that were harassing a single Breguet, and in a decisive fight destroyed one of them. Meanwhile five enemy planes approached and concentrated their fire upon him. Undaunted by their superiority, he attacked and brought down a second plane.

A bronze oak leaf for extraordinary heroism in action in the region of Bantheville, France, October 6, 1918. While on patrol he encountered an enemy formation of six monoplanes. He immediately attacked and destroyed one enemy plane and forced the others to disperse.

* * *

HENRY ROBINSON CLAY, JR.

Residence—Fort Worth, Tex. Born —Plattsburg, Mo. General Order No. 60, W. D., 1920. Near Sainsles-Marquion, France. September 4, 1918. First Lieutenant, 148th Aero Squadron, Air Service.

IN action wherein Lieutenant Clay's patrol was outnumbered two to one, he attacked the group and shot down the enemy aircraft in flames. He continued in the combat and later attacked two enemy aircraft.

On September 27, 1918, near Cambrai, France, with one other pilot, Lieutenant Clay observed five enemy planes approaching our lines and, although hopelessly outnumbered, immediately attacked and singled out a plane which was seen to crash to the ground. He was immediately attacked by the other enemy planes and compelled to fight his way back to our lines.

Posthumously awarded. Medal presented to his father, Henry R. Clay.

END

MODELS OF DISTINCTION

Build these authentic super detailed flying models and enjoy complete satisfaction. Kit contains special finished prop., full size plan, yards of rubber, cement, finished parts, balsa, movable controls, etc.

20" WEDELL WILLIAMS

Only $1.25 EA. P.P

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--just in time for Xmas

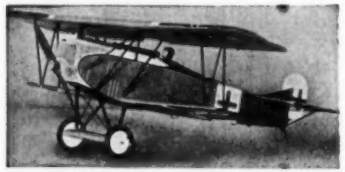
Make your selection NOW from this great display. Then go to your dealer. If unable to get the C-D's you want, order direct from us. We pay postage on all ¾" Kits for U. S.; for Canada, Mexico and British Isles you remit 10% extra; elsewhere 20% extra.

IN ADDITION TO FULL SIZE SUPER DETAILED DRAWINGS AND PHOTOS--LOOK WHAT ELSE YOU GET IN ¾" C-D KITS:

1. Pilot block for carving, with instructions. 2. Coloring for pilots. 3. Black for all details. 4. Thread for all bracewires (mostly new silver grey). 5. Printed out wood, not a few pieces rubber stamped, but every necessary curved piece printed out clearly on the finest grade of balsa wood obtainable. 6. All strip wood necessary. 7. Sufficient dope for the model, cement for glueing it together and tissue cement for applying the paper coating. 8. Complete material for scale propeller as well as that for flying propeller. 9. Coloring for propellers, whether metal or wood. 10. Authentic rib and stringer material supplied now in all Kits. (A great many filled-in fuselage jobs, too.)

FAMOUS '30 LAIRD SOLUTION

It was piloted to victory by the late "Speed" Holman in the Thompson Trophy Classic. Model flies like the Super-Solution—at a fast clip. Authentically colored gold wings and tail surfaces, balance black. Span 15¾", length 13⅛". Order Complete Kit SF-46..... **$2.50**



REDESIGNED FOKKER D-7

An authentic steady flying beauty so colored that it looks as though it were drawn right from the ranks of one of the famous German "Flying Circuses." Wings taper beautifully, new feature control movements (not from cockpit), scale propeller, authentic Spandau guns (you make all). Colored international orange, green, white, black details. Span 21½", length 17⅛", weight 3.5 oz. Kit SF-15B..... **$2.95**

DOUGLAS O-38 OBSERVATION

Very beautiful and unusually well detailed model. Authentic only as "Cleveland" makes 'em! Span 30", length 22¾", weight 4.8 oz. Yellow, olive drab, black details. 2 pilot blocks. Kit SF-43..... **$3.75**

NAVY BOEING F4B-3 or -4

Beautiful flying miniature of the masterful fighter now used by the Navy. Exciting to build—thrilling to fly. Capable of fairly long flights. Span 22½", length 15⅜", weight 3.2 oz. Colored silver, yellow and red. Kit SF-29..... **$2.85**

Our new "Dwarfs" are absolutely authentic C-D's—just like SF Kits, only smaller.

BOEING P12-E FIGHTER

Army model, identical with above Navy model—except for coloring. Yellow, olive drab, red and yellow trim. Kit SF-8C.... **$2.85**

BOEING 247

Redesigned--Printed Out Wood

This giant has a span of 55⅝" and a length of 38½", and is nothing less than a wizard for flights, with its two motors powerfully pulling. It is entirely gray colored and weighs 16 oz. The redesigned model has all curved wood printed out (an enormous quantity) with data for more authentic building and appearance than heretofore, with "filled-in" fuselage, balanced controls, etc. The thoroughly engineered drawing of four large panels (17"x44"), each contains accurate modeling information and over 16 oz. of liquids, dope, cement, etc., contained within each one of the new giant Kits. Complete Kit SF-35..... **$8.50**

AERONCA C-3

True in detail, beautiful in appearance, exciting in flights. Very easy for beginners. Span 27", length 15¼", weight 1.9 oz. Red and silver. Kit SF-40..... **$2.65**

LATEST "FURY" MODEL PHOTOGRAPH NOT YET READY

HIGH-SPEED FURY

British Hawker intercepter fighter. Now redesigned and beautifully stripped top wing and fuselage, lettering under wings, etc. Long, fast flights. Span 22½", length 19⅛", weight 2.6 oz. All silver. Kit SF-20B..... **$2.65**

Everyone's Talking About 'Em!

FLYING ½" SCALE "C-D DWARFS"—ALL 25c TO 85c

Cleveland's new Dwarf line of ½" scale models announced by popular demand made on us for C-D quality, lower priced, smaller kits. Each kit entirely complete as are all C-D models except "Dwarfs" DO NOT contain CEMENTS OR DOPES. They are exactly 2/3 the size of the ¾" scale SF models, so take descriptions given using the same design number, but the prefix, instead of being SF is D, and use 2/3 the given sizes. D-1G 65c, D-8C 65c, D-19 65c, D-20B 45c, D-23 65c, D-24 85c, D-26 35c, D-27 50c, D-29 65c, D-33 30c, D-37 75c, D-40 60c, D-41 85c, D-42 25c, D-43 85c. 10c extra for postage on each kit must be included. Watch your dealer's stock for additional numbers. Absolutely nothing else ever like them. Remember—NO LIQUIDS.

Send 5c

at once for our new catalog of kits and parts.

CHRISTMAS GIFT SUGGESTIONS

For those desiring to make a group gift of models, the group of "Dwarf" Kits, 15 models (½" scale) for only $10.00 is recommended. A group of ¾" models, consisting of all the latest, most advanced C-D's, SF-46, 47, 48, 49 and 50, as well as 21B, $19.15. All postfree.

Read Before Ordering

We have absolutely no connections with other manufacturers, so if your dealer can't supply you send all orders to the address below. Canadians and all foreign customers add 15% to every order. Special Delivery service 20c per Kit extra. C.O.D.'s 25c each order, accepted only when a dollar is remitted to assure acceptance of parcel. Overpayments always credited.

SEE YOUR DEALER FIRST—If he can't supply you, order direct.

CLEVELAND MODEL & SUPPLY CO., Inc.

1866PAA West 57th St. *Model Engineers Since 1919* **Cleveland, Ohio, U. S. A.**

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Clevelanders and those of nearby towns - - - Be Sure to Visit Our Store! Daily 9 to 6; Sunday 2 to 5

NAVY CURTISS F11C-2

The ship which needs no introduction as it has already made an excellent name for itself in Navy work. This flying model is very beautifully colored the characteristic silver with gray fuselage, green tail surfaces, cowl and other trimmings, and yellow upper wing. Span 23¾", length 16¾". Complete Kit SF-49.... **$3.75**

F11C-2 Photo Shows Model Partly Completed

NOW A REAL HAWK!

We claim for this model the distinction of being the finest and most complete authentic flying model on the market today. Colored yellow and olive drab, with the beautiful color marking of the Selfridge Field Squadron, with black lettering and red striped top wing, along with the red, white and blue insignias. Every possible detail, wing ribs, stringers, etc., reproduced. Span 23⅝", length 16¾", weight 4.9 oz. Complete Kit SF-21B..... **$3.25**

LINCOLN SPORT

Beginner's model. Span 15", length 12⅛", weight 1 oz. Cream, black trim. Kit SF-36.....**95c**

LOCKHEED VEGA

Span 30¾", length 21", weight 3.7 oz. Colored brilliant red and cream. Kit SF-24.....**$3.25**

Roscoe Turner's WEDELL-WILLIAMS

Another ship needing no introduction since our beloved Col. Roscoe controls it wherever she goes. The '34 Thompson Trophy winner. This fast flying model authentically colored Wedell-Williams gold, has a span of 19½", length 16⅜", and weighs 2.9 oz. Complete Kit SF-48, postfree, at..... **$2.95**

WEDELL-WILLIAMS

Yes, this is the '33 Cup Winner which Jimmy Wedell himself flew to victory, and the same one with which "Doug" Davis won the Shell Trophy in 1934. Red with black scalloping and bronze motor crankcase and color separations. Weighs 2.9 oz., span 19½", length 16⅜". Excellent speed flights. Complete Kit SF-46 **$2.95**

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Dusting

(Continued from page 26)

men. There should be an entomologist on insect pests, a plant pathologist on plant diseases, and a chemist on materials and controls. They should work in cooperation with the state agricultural authorities and federal bureaus.

The service operator must have had sufficient experience to have gained a thorough knowledge of controls under field conditions. It is well to remember that laboratory and hot-house tests are not sufficient. Controls act differently under these artificial conditions from the way they act in actual practice.

He should also be properly equipped, financially as well as from the standpoint of shop and field equipment. With investment and equipment involved, plus a reputation to uphold, he is bound to do a more thorough job. Probably no factor is more important in the work than the timing of the applications. Improper timing means ineffectiveness in kill.

High-grade, tested materials, lowest prices, proper mixing, etc., are insured by having the service organization buy them and re-sell them to the grower, rather than letting the grower shop around with his inexpert knowledge of the subject. The operator should insist upon this, as the results of his work depend upon the quality of the materials, and he can take no chances.

There is the so-called "gypo" in this business as in many others. He is the irresponsible fellow who owns a plane and can fly and sprinkle dust, but nothing more. He has not made a study of the entomological and chemical problems involved. He spreads a ton or so of chemicals for a stipend, and is gone. Frequently, through ignorance, he does the crop irreparable injury.

Since federal and state experimental stations now recognize and recommend the use of the airplane in applying chemical dusts, as an economical and effective method of distribution, the grower's chief problem at the present stage of its development lies in the selection of the service company or operator. Therefore, it is necessary to be able to give him references as to past performance and permit him to check these references. It is the old stand-by method of getting to the bottom of things, and the farmer is a past master at it.

END

Two-Cycle

(Continued from page 32)

rod and the crankshaft. It is considerably lighter and we have without doubt improved its efficiency providing, of course, we can get it to work minus the trimmings, and if it were only possible to remove also that wasteful induction stroke and to have an extra power stroke in place of it the ideal would be attained.

Well, of course, we know that someone did this years ago and that the small two-stroke motor used today in lawn mowers, washing machines, and to take a wide step, outboard motorboats, is the result.

When such a definite improvement was effected how was it, you may ask, that the old four-stroke principle survived? How is it, that in spite of these improvements, the four-stroke motor is still used in plane and automobile?

Let us look into the innards of our two-stroke friend.

In the simplest and therefore ideal two-stroke motor, the explosive charge is first drawn into the crankcase and then injected into the cylinder to be compressed and fired.

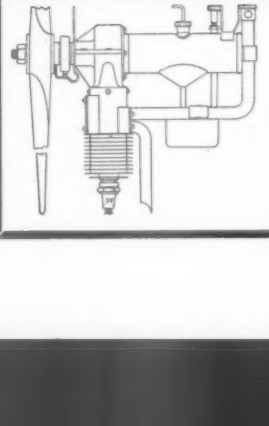
The exhaust takes place when the piston has almost reached the bottom of the stroke and has uncovered the exhaust port, at the same time that the piston uncovers the transfer port from the crankcase through which is injected a fresh charge which fills the cylinder and clears out the remnants of the exhaust gas.

The initial induction into the crankcase is delayed while the piston rises and forms a vacuum therein, then as the piston finally uncovers the port from the carbureter the fresh gas is forced into the crankcase by the greater air pressure outside. So the exhaust and induction strokes are eliminated, these operations taking place simultaneously at the end of the downward power stroke.

The two-stroke motor is light and simple, it can be constructed cheaply and is extremely economical to run. It has no delicate parts to wear or break and its even power output gives great smoothness of operation even at slow speeds, it is theoretically the ideal aircraft motor.

Well, much as I hate to admit the fact, the two-stroke has its imperfections and most of them start with the fact that the burnt gas is exhausted through the side of the cylinder.

END



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More Speed

(Continued from page 18)

thing and too young an industry for the air-lines to continue with a policy which is comparable to the nationalistic policies of countries which are fomenting war in Europe and the East at this instant.

The consequences of such practices are already becoming apparent. The year 1934 showed little increase over 1933 in the number of passengers carried. True, there has been an increase in the number of passenger miles flown, but this merely shows that people who already fly are traveling longer distances by air, and is as it should be. The present of air transportation depends upon those who now fly, but the *future* depends upon getting a goodly portion of those *millions* who annually use surface transportation to use the air.

Such is the vitally important problem facing the airlines now. In spite of the finer equipment, the improved service offered, the figures show that for the most part all the lines have accomplished in the past year has been the pilfering of passengers from each other. Each airline, by cutting the others' throats, by refusing to cooperate with the others, by being petty and mean and small, has contributed its part toward the retardation of the realization of the true meaning and purpose of air transportation.

With the stabilization of equipment coming about, the major airlines in the United States will have little to offer over each other beyond departure times and the routes they traverse between the competitive terminal points. Now they will have two avenues of effort open to them—to continue their past practices or for once in their lives to get together and make a great cooperative effort to increase air traffic in general, and thereby all reap the benefits thereof.

In 1933 there were *ninety million* passengers carried by the railroads in the United States as against *one-half million* carried by air. When one thinks of the possibilities of increasing air traffic it staggers the brain, numbs the imagination. When one observes the all too few intelligent efforts to tap this great potential traffic, one is numbed again, but in another way.

If the airlines would but realize that their individual efforts, limited by their finances and overlapping each other, are but little splashes in a mighty big pond, and that their concentrated efforts to increase air traffic would bring about results which would astonish them out of their stupidity and benefit all, then we might look forward to the swift realization of the progress air transportation rightly deserves. The most important thing in commercial aviation today is not "Use my line," but "USE AIR TRANSPORTATION."

END

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Aero-Sportswoman

(Continued from page 24)

fect of the hundreds of piles of rocks in one of the great halls, each bearing the name of some special society.

The writer, not being an Eastern Star, a Legionnaire or a Boy Scout, felt a bit disconsolate until Clayton suggested starting one of our own. Whereupon, we promptly constructed a small plane out of the driftwood left by the high waters of the River Styx to be used as the official marker. And we hereby invite all our air-minded friends to add their rocks to the new shrine when they visit the famous cave.

On the way home we stopped over in Atlanta, Georgia, and had the pleasure of meeting Madeline Johnson and her flyer husband. Madeline was avid for all the news we could tell her about women flyers, which is one more proof of the need to support that fine little magazine *Airwoman*. (Modesty forbids us to mention a mere column such as this!)

There is a grand bunch of air-enthusiasts down at Atlanta, and we hope to tell you a lot more about them and the things they are doing in the near future. The field there is comparatively small in size but ranks third in the U.S. in general air-traffic. Among the private flyers there is a successfully operated flying club with twelve members and two ships, of which they are very proud. The 99s in other places may have their own corner of the hangar or a room in the administration building, but in Atlanta the girls are fortunate enough to have their own little club house. Madeline's own ship was being overhauled, but she arranged for one of the boys to take us in one of the club ships for a ride over the city and down to see the famous Stone Mountain.

We would like to tell you more about the trip itself, of the long, lazy days in the Blue Grass country of Kentucky, of the mysterious shadowy depths of Mammoth by flickering torchlight, of the full moon over our log cabin in the Cumberland Gap and the crooked one above the bay at Charleston. We would like to tell you of that 1,500 miles of blazing fall colors and its glorious climax in the Great Smokies—but as our good friend, JBR, would tell us that this isn't a travelogue nor an advertisement for the Sunny South—so we will merely offer the suggestion that October is an ideal time to go exploring.

THE first two issues of *Airwoman*, successor to the little magazine, The 99er, are out. We hope that you like them, because we think it has keen prospects of developing into something most worth while. Mrs. Green and the rest of the W.N.A.A. officials are tremendously enthused about it, and are joining the 99s in giving it invaluable assistance and support.

A number of the air transport companies, such as TWA, EAT, Boston and Maine, and the Pan-American are lending their cooperation by distributing copies of the magazine to their passengers en route. The editorial staff has been working overtime and is getting some grand ideas lined up for future issues.

We must admit that we were somewhat amused and no end curious, when we heard that Fay Gillis was to be the Fashion Editor! We couldn't help but wonder what the Soviet Union had to offer—if Moscow was out to steal the show from gay Paree. But mystery is solved, the globe-trotting Fay is back in New York, simply bubbling over with the joy of being home again.

In the November issue of *Airwoman*, Miss Gillis gives an authentic world-traveler's ideas on luggage. We are looking forward to her future articles on fashions for we know how entertainingly she can write.

END

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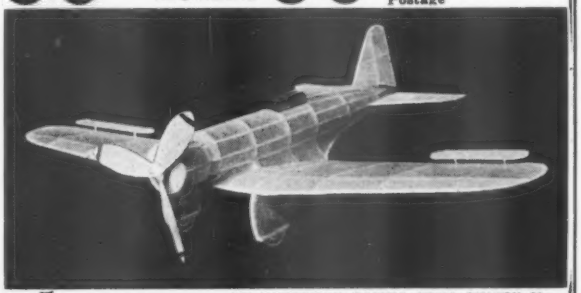

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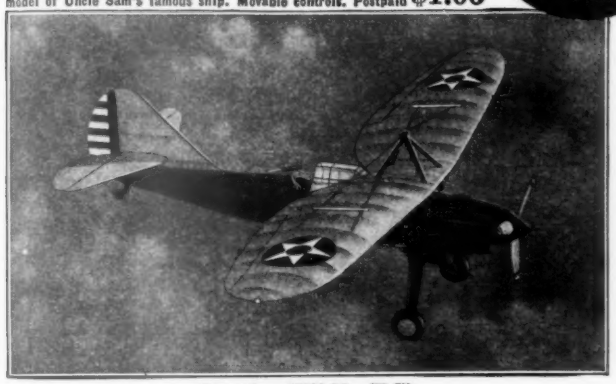

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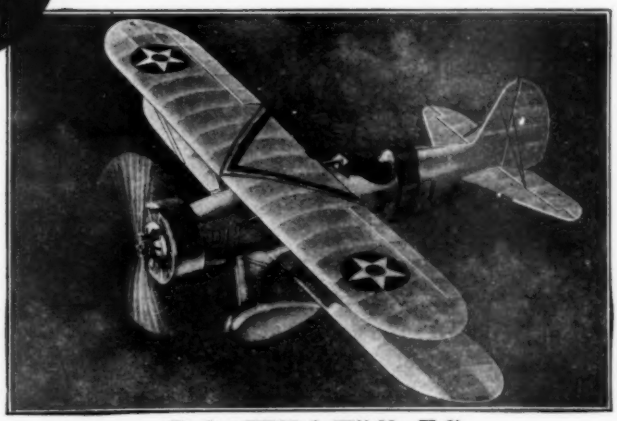

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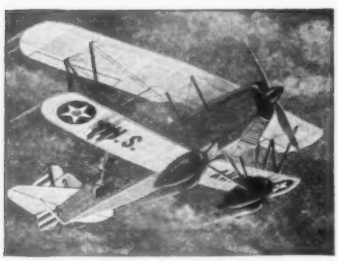

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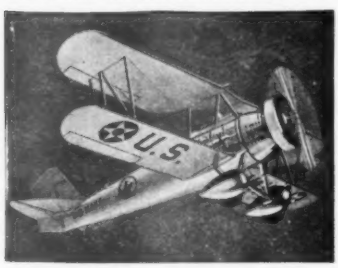

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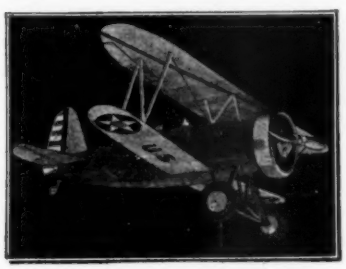

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Mal Freeburg

(Continued from page 10)

passengers' lives but also the six-year record of Northwest for never having a passenger fatality.

That was back in 1932 when official Washington wasn't very air-minded. But, one day, Mal opened one of those stampless envelopes containing an invitation from President Hoover to come to the capitol where the Congressional Medal of Honor would be conferred upon him. Mal must have been pretty busy as he politely informed the Administration that he "couldn't make it" for the present, but would come as soon as possible. He found time—over a year later.

* * *

IT was the night of September 18 of this year. Mal Freeburg had just lifted a new high-speed twin-engined Lockheed "Electra," carrying five passengers besides himself and Co-pilot John Woodhead. off from the St. Paul airport. A few moments later he throttled down for Minneapolis, his last stop before he reached Chicago. But suddenly Woodhead jabbed him with his elbow. Something was wrong. Wood head confirmed his fears—the retractable landing-gear was jammed shut and, despite their efforts, couldn't be lowered!

Deciding to return to their base, Woodhead circled the St. Paul airport for an hour while Freeburg, with the aid of a man passenger, tore up seats over the gear mechanism and attempted to clear the trouble. They had to give up, however, as the only tool they had was a pair of pliers. Returning to the controls, Mal flew over to one side of the field, opened the dump valves on his tanks, cut the engines and came in for a landing. Below, the field was lined by ambulances, fire trucks and a goodly portion of the morbid public. One consolation was that the Lockheed company had made several of these very landings with little damage.

This reminded him of that afternoon back in '32. Come to think of it, he had at least had one good wheel on that Ford. Here, well, he was without a "wheel to light on." Not helping matters any was the fact that this ship landed plenty hot. Hot, in this case, meant 75 miles an hour! Well . . . . There was a scraping noise, a shower of sparks and—a Chicago newspaper might well tell the rest of the tale.

". . . and brought the ship to a vertical three-point landing. The ends of the propeller were bent and there were a few dents, but that was all." Two days later the Lockheed was back in the air.

Shortly after this last episode, I sat next to Mal in that ship and, more out of curiosity than anything else, asked him what it was about landing this last time that impressed him most. He was warming the ship's Wasp Juniors at the time and, throttling them down, he smiled at me and pointed in the direction of his left shoulder.

"Well," he said, "would you think it possible for a man even as small as myself (he's about five feet eight inches tall) to climb through one of these?"

If you have ever seen those tiny, sliding windows beside the pilots, then you'll agree that it might be considered a physical impossibility. However, Mal's grin was even broader as he modestly informed me that he had accomplished that very thing. Of course, I wanted to know how and why and, after a little persuasion, I got this story:

"I still can't see why everyone made such a fuss over that landing. It was a proven fact that she could do it. It was a lot easier than bringing that Ford in. However, I *did* dive through that window.

"The ship had already skidded to a stop and I had assured myself that everything was O.K. All was quiet for a few seconds then suddenly there was a commotion among my passengers. Two of them, both supposedly dignified, elderly matrons, were trying to fight their way past Jack (Woodhead) all the while yelling something to the effect that it was absolutely necessary that they kiss me for saving their lives.

"So, I went out that window and it was a dark hangar that finally stopped me!"

END

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Gustave Whitehead

(Continued from page 24)

chine, all but demolished, while the agonized fireman in the back writhed with the pain of a scalded leg. The glasses for indicating water-level in the boilers had broken, permitting steam to envelop the man.

While all this unusual performance was taking place in Pittsburgh in 1899, two young men were zealously testing glider models in their home in Dayton, Ohio. Orville and Wilbur Wright had not solved to their satisfaction a problem which troubled them, a problem of controlling and balancing winged machines in the air, and their first man-carrying glider was nothing but a dream as yet. In Germany Graf von Zeppelin was busily overseeing the construction of his rigid airship, while in France Santos Dumont was testing petrol-driven airships and Captain Ferber was experimenting with heavier-than-air machines.

Spring went by, then summer and one rainy day in October of that year, 1899, a crowd stood in the rain at Stanford Park, near Market Harborough, in England, to see Percy Pilcher make his first test of a power-driven glider. Percy Pilcher looked at the sky and shook his head. The weather was not to be trusted. But the crowd grew restless. The long wait and the rain were fast convincing them of the soundness of logic they had often repeated, "If man had been intended to fly, God would have given him wings."

Not to disappoint the crowd utterly, Pilcher prepared to make a glider flight in his tried and trusty "Hawk" as he had done many times before. All was ready. Pilcher took his place and the machine was being towed rapidly over the ground when the tow-rope broke. The crowd murmured in disgust. Hastily the rope was repaired and another start was made.

Breathlessly, they saw Pilcher sailing splendidly into the air, up and up to a height of nearly thirty feet—suddenly a guide wire in the tail snapped. The tail collapsed. And before the eyes of the crowd could credit what they saw, down came Pilcher and his "Hawk" in a heap upon the crowd. Two days later Pilcher passed away without regaining consciousness, one of the earliest martyrs to aviation.

Like Gustave Whitehead, Pilcher designed and constructed his own motor and plane. His plane, in which the motor was to be used, had been a triplane, while the plane used by Gustave Whitehead in Pittsburgh the preceding spring had been a monoplane. Gustave Whitehead's flight had been brief too, not over a half-mile—less than 2,640 feet. Yet it was more than four years later that the Kittihawk flight of 852 feet, lasting only 59 seconds, took place and eventually won the acclaim of the world.

The realization that he had flown was all the mechanic-engineer had over which to rejoice as he lay for weeks in the hospital recovering from his wounds. Poor comfort it was without a doubt, but it spurred on the enthusiasm he had shared with his inventor-friend, Gustave Whitehead. They had been taking turns working in a coal mine at Wilcox, Pennsylvania, while in spare time Whitehead repaired guns and did like odd jobs to help earn the extra pennies his experiments required. With a young family to support, money was not too plentiful, but true inventive enthusiasm is not easily downed.

Misinformed by so-called scientists of the day, regarding comparative strengths of different metals under steam pressure, these two men had tested out boiler after boiler of different metals. And boiler after boiler had been blown to bits as they tried and tried for the mathematical and scientific exactness they required.

The neighbors had not always shared the enthusiasm of their inventive friends during this stage of their labors, particularly as much of the experimental work had to be done after working hours at night, and many a neighboring window pane went hurtling into the darkness along with the bursting boilers. But the tests resulted in

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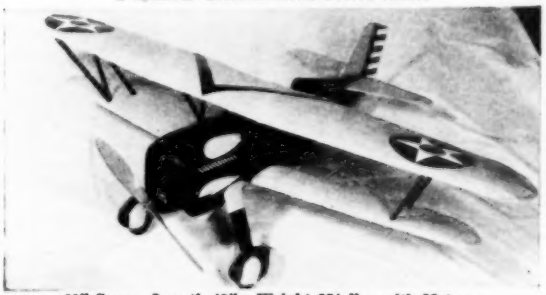

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the finding of a boiler that would somewhere nearly meet the requirements of the inventor.

A test model had been made first, then the one that really flew. Today, the model looks a little odd to be adapted to airplane propulsion, but it is apparently as sturdy and ready to demonstrate as the day on which Gustave Whitehead turned it out in his workshop.

When Gustave Whitehead's friend and assistant had recovered sufficiently to leave the hospital, still carrying the scar of his scalding which was to be for life his only medal of honor for the first airplane flight, the two men agreed to go to Bridgeport, Connecticut, where they hoped to find more suitable employment in a factory. Together, they traveled to Bridgeport on bicycles and found the desired employment.

Gustave Whitehead sent for his family to join him. Although the employment was better in Bridgeport, spare time for indulging inventive ambitions was even more scarce. Louis Darvarich, the mechanic friend, married and the demands of growing families compelled both men to devote less of their time and funds to the inventions Gustave Whitehead's busy brain could devise.

Often, however, the demands of genius were too strong. Both Mrs. Whitehead and the children found it necessary to seek employment, while in a fever of the certainty of success that would compensate for all privations, Gustave Whitehead devoted time and money without stint to his experiments.

Almost any of the local machine shops were glad enough to employ him when the need for more funds drove him to them, for he was a master mechanic. But he remained only long enough to acquire what his immediate needs demanded and he was gone, back to his beloved inventions.

Men of means, fired with his enthusiasm, came, saw, listened, contributed for a time to his experiments, then grew discouraged and disgusted when his insistence upon perfection caused Gustave Whitehead to destroy one after another of his airships and start anew.

To the promoter it seemed well enough that his invention flew. To a public that could not then vision a flight much beyond a quarter of a mile, such demonstrations would have been convincing enough. But brief flights, running starts, too heavy materials and half-realized dreams were not for Gustave Whitehead. There were quarrels. Charges of unfairness by promoter and inventor were sometimes hurled. But through it all Gustave Whitehead remained steadfast in his search for the perfect airplane.

Young boys and men, mechanically inclined but lacking means, were his most eager assistants. It was nothing for them to linger over their work until early morning hours, absorbed with the same interest that drove their inventor friend, while they gleaned unforgettable lessons in mechanics from him.

Gustave Whitehead did not fly any more after his circle over Long Island Sound that 17th day of January, 1902. The weather was becoming threatening, the day was nearing its close, and in spite of the enthusiasm of his workers, the plane was returned to the Pine Street back yard.

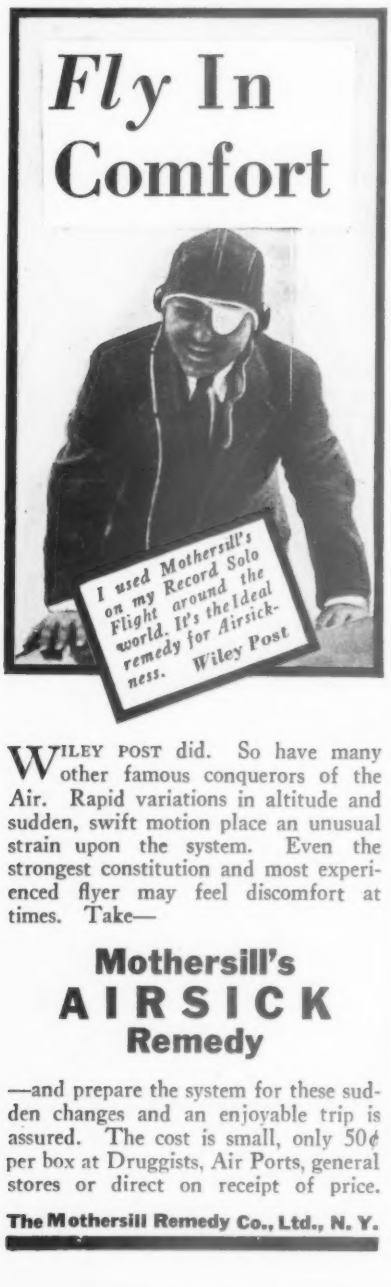
Winter come in earnest. Through its storms the plane rested unprotected in the yard; there was no money to secure a shelter for it, because only a short time before, Whitehead and his financial backer had quarrelled. Spring came and the motor had been ruined; the plane itself was not thought trustworthy in view of the ravages of winter. There was nothing for it but to construct another.

In April, 1902, John Whitehead, a brother, arrived from California and volunteered to assist his brother in his construction of airplanes. Neither had sufficient money, however, so both found employment and continued the labors at night as best they could. When there was not sufficient money for airplane construction, gliding could still be accomplished and Gustave Whitehead became a very proficient glider.

A young reporter, name MacNamara, found Gustave Whitehead and "his delightful Weber and Fields dialect" interesting copy. Now editor of the Bridgeport "Times," he tells me he once called upon Whitehead just in time to see a young assistant make a flight in a glider. MacNamara asked to be permitted to do likewise, and his wish was granted. A triplane glider was one of the most interesting of Whitehead's inventions.

In September and October, 1902, the Wright brothers were ready to believe they had pretty well mastered the art of gliding, for during those months they had completed nearly a thousand glides, some of them more than 600 feet in length. A motor for their plane was the next step.

Meanwhile, in Bridgeport, there appeared a picturesque figure. He was Colonel Buffalo Jones, characterized so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well by Zane Grey. Buffalo Jones had his own ideas of inventions and he had his ideas concerning who could construct the type of engine he had in mind, to his satisfaction. Gustave Whitehead's genius appealed to him, and as neither knew the probable cost of such work, the figure agreed upon was too small for Gustave Whitehead to realize any profit by the time the work was completed.

He then took up building motors for others for a time, hoping thus to secure funds for his own work. But his profits were small and progress with his own engine was slow. When he had completed his new type engine, for the also newly constructed airplane, although it was a forty horsepower, four-cylinder, four-cycle gasoline motor, it was not sufficiently powerful to lift the plane. To determine the thrust required, he tested the plane by attaching it to a locomobile car and having it towed for a distance. Finding that a motor of sixty horsepower was required, the brothers set to work again.

To make sure of plenty of power to spare, they designed a 200 horsepower, eight-cylinder, four-cycle, V-shaped motor. They were encouraged now, for a new backer from New York had sought them out and, assured of funds, they felt success was within their reach. But the new backer proved their undoing, for he insisted upon testing the new motor in a boat on the Sound, and in his eagerness he advanced the spark too rapidly, the boat capsized and lost the motor.

Again, Gustave Whitehead started construction, but now 1903 had more than half run its course, and Professor Langley, encouraged by the War Department to renewed effort, was busily attempting to launch a large duplicate of his flying models, a duplicate large enough to carry a man from a houseboat on the Potomac. The means of launching was by a catapault. Unfortunately, the catapault failed to operate satisfactorily and the plane caught and was thrown into the water on each of the two attempts Langley made to launch it. The public, always ready to doubt if the Deity actually intended man to fly, could not heap enough abuse upon him.

When December 17th came, there was activity in the Wright Brothers' camp at Kittihawk. A few days later came reports of flights, not at first generally accepted, flights the brothers had succeeded in making in a power-driven man-carrying, heavier-than-air flying machine.

The Wright Brothers had much in their favor at all times. They had independent means, they had the encouragement of others working in the same field, they belonged to organizations where their work would find reception and publicity, they spoke English fluently and their background was such that they knew how to use it skillfully to carry their audience with them.

They took out patents promptly and had every means of establishing their claims. And so, to the Wright Brothers, after years of bitter controversy with those who believe in the efficiency of Professor Langley's plane, has been generally conceded the palm of having been the first to fly.

Disheartened and discouraged, Gustave Whitehead had still not lost sight of the fact that an airplane would never be really practical until it could rise vertically from the ground. He had always been in the forefront of those who could foresee what were the needs of practical aviation. He had been early in putting wheels under his planes to launch them into the air, while the Wrights were still using a pylon and derrick arrangement several years after their first accredited flight.

Gustave Whitehead was among the earliest to seek light weight and strength through the use of aluminum and silk. He was one of the few who made both motor and plane for his airplanes. But now he turned to his ideal, a helicopter.

One such helicopter was completed but, although his enginge lifted it, he saw a more powerful one was needed, so he started construction of another larger helicopter along the same lines and a more effective engine. But once more he and his backers disagreed. The law was with the latter and all his shops and equipment were seized. It was the final blow to a long-suffering genius. Gustave Whitehead never lost his interest in aviation, but he died without completing his helicopter.

END

Bird Flight

(Continued from page 29)

face it is similar to a low aspect-ratio flying-wing as shown in Fig. 4. Extending our assumption, and denying that there cannot be an efficient air or fluid flow in a straight line, we will find that we have to resort to low aspect-ratio surfaces in building sails, rotative motion of bullets and rotative motion of fluids through pipe lines.

The birds observed were the seabirds common to Florida, pelicans, petrels, gulls and similar soaring birds that would come within short range.

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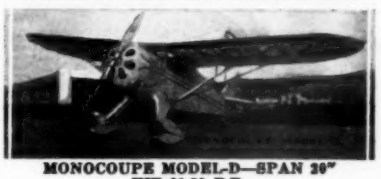

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Coast Guard

(Continued from page 14)

a patient ill with acute appendicitis from a ship at sea and transported him to a hospital ashore, saving his life. And once he made a hurry trip to Key West to carry serum to a little child who would otherwise have died.

He probably gave a group of distinguished passengers, including a Congressman, the thrill of their lives when he took them on a routine patrol flight to observe the work of Coast Guard aviation. They got a dramatic demonstration.

Seated comfortably in the flying boat *Sirius*, they were droning along over Turtle Reef when suddenly, far below, something attracted Olson's attention. Men could be seen running about on the decks of a good-sized yacht and signaling frantically. Olson banked the big plane up on her side and looked closely. They were evidently in trouble.

He headed down for a landing in the choppy sea. As the plane struck the water, a wave broke over the tail and smashed the left horizontal stabilizer so as to jam the left elevator.

With the wind popping all around and with half of the longitudinal control out of hand, it can be imagined that Olson had a real man-sized job of piloting on hand. It was a case of plowing her through the heavy seas to the first home port.

When the *Sirius* came alongside the yacht, it was found that the latter vessel was stranded with her fuel supply exhausted. A Coast Guard cutter was radioed to come to her rescue. Then Olson found that it would be impossible to take his plane back into the air. It was necessary for him to taxi through that heavy sea all the way back to Miami, where he brought his battered craft safely to the Air Station.

END

Design

(Continued from page 32)

between a monoplane and a biplane of equivalent aspect ratio is, can best be shown by an illustrative example. A biplane, of gap-chord ratio 1.00, must have a geometric aspect ratio of 10.0 in order to have a monoplane equivalent of 10.0. Comparing the spans of a monoplane with a wing area of 150 square feet, and a biplane of the same area with the upper and lower wings of the same areas:

$$AR = b^2/S \qquad (1)$$

Where AR = Geometric Aspect Ratio

And for the biplane:

$$b = \sqrt{10 \times 150/2} = \sqrt{750}$$

$$= 27 \text{ feet, } 5 \text{ inches.}$$

Thus, it may be seen that the saving in span, without loss of efficiency, is but slight and in most cases would be less than indicated above, as the area of the upper and lower wings of a biplane are seldom the same. A greater saving in span can be effected, of course, by using a geometric aspect ratio of 6.00 for the biplane, and suffering the loss in efficiency. In that case the span would be:

$$b = \sqrt{6 \times 75} = \sqrt{450}$$

$$= 21 \text{ feet, } 4 \text{ inches.}$$

Another possibility is to use a tapered wing on the monoplane, thus reducing the area at the tip. However, the simplest course to follow is to use a wing-section with a high maximum lift coefficient, and then decrease the wing area as much as possible without making the landing speed greater than 35 to 40 m.p.h.

Such a landing speed is not too high and is, in fact, preferable to one too low from a standpoint of controllability, as there is danger of losing lateral control at very low speeds, due to decreased rudder and aileron effectiveness.

Stick forces, landing speed and wing

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

OF POPULAR AVIATION, PUBLISHED MONTHLY AT CHICAGO, ILL., FOR OCTOBER, 1934.

State of Illinois } ss.
County of Cook }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared H. Geo. Davis, who, having been duly sworn according to law, deposes and says that he is the Editor of the Popular Aviation and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Aeronautical Publications, Inc., 608 So. Dearborn St.; Editor, B. Geo. Davis, 608 So. Dearborn St.; Managing Editor, J. H. Rathbun, 608 So. Dearborn St.; Business Manager, A. T. Pullen, 608 So. Dearborn St.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Aeronautical Publications, Inc., 608 So. Dearborn St.; W. B. Ziff Co., 608 So. Dearborn St.; W. B. Ziff, 608 So. Dearborn St.; David Ziff, 608 So. Dearborn St.; B. Geo. Davis, 608 So. Dearborn St.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and security in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

Sworn to and subscribed before me this 28th day of September, 1934.

A. T. PULLEN
(Signature of editor, publisher, business manager or owner.)

M. GNASS
(My commission expires February 26, 1936.)

area small enough to make the ship stable in all kinds of air, are not the only considerations in the design of the plane, however. In order to get the economy mentioned above, it is necessary that the engine be of fairly low power, so that the fuel consumption will not be too high, but at the same time the plane must be sufficiently fast to avoid throwing the gain away.

This means, of course, a good clean design and a wing-section with a high ratio of maximum lift to minimum drag. This latter is needed in order to have a high speed range, and thus a high enough top speed without too high a landing speed.

It is better to gain in speed range in this manner than through the use of flaps, or some similar device, as the flaps mean an additional control for our "dub" pilot to worry about, and possibly to misuse.

The need for stability has been mentioned above, and it has been seen that it is necessary to work out a compromise between the stability and the maneuverability of the plane. One other phase of stability to consider is spinning, and certainly the ship must have a slow rate of spin, recover rapidly and have no tendency to spin flat.

Not least important in designing a plane for the private flyer is the looks of the ship.

And in respect to the appearance of the plane there is a great deal to say. The well-known fact that fancy paint jobs sell automobiles is also true of paint jobs and trim lines with airplanes. The prospective customer expects and demands a classy looking layout, and if the prospective customer is a woman, oh . . . . . .well!

Many ships showing excellent performance have failed to achieve a commercial success because they were not good-looking. And, unfortunately, there have been very few good-looking lightplanes. And, it is just as easy to design a ship that will create desire in the minds of the public as it is to lay out a poor-appearing ship.

If the average person is to be interested, the plane must be one he will be proud of showing to his friends, and this will be more and more true as the market grows.

And last of all, the plane must sell for not more than $1,200.

END

Rotor Ships

(Continued from page 20)

blades would control both its lift and its horizontal speed. Inventors are working for this ideal and we may see it in the skies within the next decade or two.

The development of the rotorcraft is at about the same stage as that of the paddle-wing ship. Like that of the paddle-wheel craft it has attracted a number of pioneer inventors who have set their ideas on paper and one builder who has actually constructed a craft. The race is on between the two types. The writer is of the opinion that the rotorcraft will succeed first, because it does not have such mechanical complexities as are inherent in the feathering blades of the flying paddle wheel.

The questions before us are: (1) Is the rotorcraft theoretically safe; and (2) is it theoretically efficient?

It should not stall so easily as the airplane because, no matter how steeply the pilot points its nose, the rotors still will turn (provided of course the motor is working) and exert a lifting effect so long as the craft is going forward. The fixed airplane wing, on the other hand, at a certain angle completely loses its lift.

Moreover, as we shall see in a later article when we come to the problem of designing a practicable rotorcraft, certain or all of the lifting rotors might be so placed with respect to the airstream and the center of gravity of the plane and be of variable speed so as to automatically keep the craft on an even keel.

If the rotorcraft was properly designed, it should be able both to take off and land with a very short run or possibly with no run at all. Thus, theoretically, the only feature that might militate against its safety would be the possibility of failure of the motor that turned the rotors. If this motor failed, landing would be dangerous.

Motors, however, are being improved constantly; and this theoretical disadvantage in practice could be almost eliminated by the use of the simpler and surer Diesel engine or electric motor, both of which should be made practical for air use in the near future.

From the viewpoint of efficiency, the rotorcraft in the forms that have been patented to date, is at a disadvantage when compared with the airplane. This is because long rotors of low lift-over drag ratio are required to lift a loaded machine in the slipstream of the forward propeller. The usual lift-over-drag ratio of the rotor is about five or six, whereas that of the airplane wing may be as high as twenty.

But this disadvantage also, as we shall see in the next article, may be eliminated by invention in adapting the rotor principle to aircraft.

The writer's conclusion from the foregoing analysis, therefore, is that the rotorcraft is both possible and probable as an efficient future means of air transportation.

END

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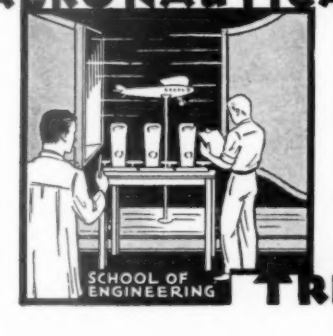

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(Continued from page 38)

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Top speed at 2,100 r.p.m.	100 m.p.h.
Cruising speed, 1,800 r.p.m.	85 m.p.h.
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Climb first minute	700 ft.
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Complete detailed factory drawings, construction photographs and assembling information for both the motor and plane will be published in a series of articles in POPULAR AVIATION. The first of these articles will appear in the next issue. END

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Airy Chat

(Continued from page 4)

insignia on the back cover represents a helluvalotta work and we hope that you will like them.

* * *

WE MAKE a practice, in every instance, of checking up the front cover color drawings with the manufacturers of the plane shown. First, the manufacturer is given a rough draft of the drawing asking for his criticism and any suggestions that he might have to offer as to the details or any new accessories that might have been added after the photographs were taken. With this information at hand, the drawing is completed and sent to the manufacturer for approval. In this way, and only in this way, are we sure of a correct and authentic picture.

And now we have a pleasant letter from T. Claude Ryan, Ryan Aeronautical Company, San Diego, Calif., the man who built Lindbergh's Spirit of St. Louis. We sent Mr. Ryan the framed painting of the new Ryan S-T low-wing monoplane, and this is what he has to say:

It was a most pleasant and welcome surprise for us to receive yesterday, the framed painting which your artist, Herman R. Bollin, had prepared of our new Ryan S-T low-wing monoplane for the front cover of the current issue of Popular Aviation.

Permit me to extend to you my sincere appreciation for your thoughtfulness and also extend to you a cordial invitation to visit us so that we may have the pleasure of meeting you personally and showing the vantage point where we have already hung the picture on the walls of our administration building.

I also wish to compliment Mr. Bollin for his accuracy, both in minute details of the plane's construction as well as the general true spirit of life and action which he has incorporated in the painting. To have done this with such accuracy without having seen the plane, seems to me to be remarkable.

Mr. Bollin takes every effort to have every small detail correct, and so far, has succeeded admirably with his work. Be assured that every drawing that appears on the front cover carries the full approval of the builder.

* * *

MR. MOORE, an authority on aviation patents, has written an excellent series of two articles on the development and principles of the rotor plane, the first of which appears in this issue. A number of patents have been granted on applications of the rotor principle, but we are still waiting to see a flying example of what appears to be a practical system of lift and propulsion. Unfortunately, not a great deal of experimental work has been done on this project and most of the ideas are still paper ideas.

* * *

IT'S a funny thing about that Kontact Klub Kolumn. One month we will have a deluge of notices and the next month only one or two will appear. And this is an off month.

* * *

HERE'S a word to our authors who submit stories to this office and then forget to attach their address. Just at the present time we are holding checks for about a dozen different writers who have neglected to give us their address or even their names in some cases.

To avoid confusion in the future, please place your name and address on the first page of the manuscript. Attached letters are likely to get lost or blind filed so that we cannot locate them. How are we going to find a letter from an author in our files if his name does not appear on the manuscript? Please, both for our sake and your sake, comply with our request.

* * *

WE wish to introduce a new writer to our readers. This is M. A. Roddy who has had a considerable amount of experience in aviation and who has been connected with the Chicago Herald and Examiner for the past sixteen years. He will give you the latest news flashes in the field of aviation and will bring you into close touch with aviation's personalities.

* * *

FROM TIME to time we get many letters from our readers who are resolved upon one thing, and that is, the belief that airline operators should place more stress on comfort than upon m.p.h. They believe that a speed higher than 150 m.p.h. is unnecessarily fast and that more commodious passenger quarters are of more consequence than higher speeds.

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sides to this story because it appears that the bulk of the patronage goes to the lines operating the fastest plane. We would like to put this thing to the vote of those of our readers who regularly patronize airlines. It will bring forth interesting comments and constructive criticism on an important matter in aviation.

* * *

POPULAR AVIATION is going into a very important matter in a big way. We intend finding out just why there are so many crashes on certain of the big-time airlines which apparently are never investigated nor penalized. We wish to know why certain ships are granted an A.T.C. before their flight tests and why they are allowed to fly several thousands of miles before they are inspected. All of these things are vital to the future of commercial aviation in this country and we demand that the air-traveling public be given a break when flying over the airways.

We have received the compliments of the National Safety Council on this new crusade, and they have given us many figures on airway accidents that make this investigation possible. Contrary to the statements of some of the airline officials, we are not simply digging up dirt to throw. We are trying to improve the situation which is rapidly becoming alarming.

* * *

THE OTHER day we received a letter from a prospective writer that gave us the jitters. The author wished to know what our policy was in respect to amateur flying and the private ownership of planes. He even suggested that it would be a good thing if we stood up for the amateur. Well, what do you know about that? We wish he'd sit down and read a file of our past issues, going back to the Howl Department and the many other departments that we have, from time to time, instituted for amateur interest.

* * *

AND HERE is another one along the same line, and it comes from no less a personage than Les Long himself. Fie, fie, Les, how do you get that way? He says:

Have heard through various sources that your attitude toward amateur aviation has changed, but nevertheless, hope you can run this photo.

Les then proceeds on with his letter, giving us the biggest shock we have had in years. No, Les, we haven't changed a bit. As a matter of fact, I believe this is propaganda launched by one of our esteemed contemporaries in which you have taken so much interest of late. There were no less than seven lightplane articles (including one of your own) in our last issue and we believe that this is ample evidence that we are still with the amateur and lightplaner.

* * *

WELL, BOYS, there are about a a dozen different commercial flivver airplanes in the less-than-a-thousand-dollar class, rarin' and ready to go, but where are the 10,000 customers that are supposed to be placing their orders?

Perhaps their glass-eyes, wooden-legs or high blood-pressure prevents the air-minded patrons from getting the necessary student's permit. Perhaps these same prospective customers have spent their $700 for an automobile that they are permitted to drive without taking a physical examination.

* * *

OUR OLD FRIEND, T-2003, dropped in on us the other day. He left a number of fine military air-stories behind him which will appear in future issues of P.A. His story, describing an attack on a fleet which appears in the next issue, is authentic and represents the most modern military methods now in use.

* * *

IT is certain that the accidents on scheduled airlines in the U.S.A. are not decreasing. The National Safety Council shows that while the number of passenger miles per fatality was 38,321,196 during the first six months of 1933, that this has increased to one fatality per 5,848,223 during the first six months of 1934. The fatal accidents are therefore nearly seven times greater in 1934.

* * *

I'll be seeing you here next month.

J. B. R.

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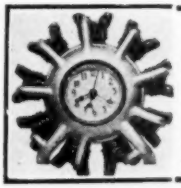

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Special 4-bladed Propellers to give you more Speed and low C. G.

4'—4B—Ford A and T, Chevy, Star.....$12.00
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6'—2B—Ford A and T, Chevy, Star..... 9.50
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All of these propellers are cloth tipped. Send cash with order for prompt service.

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CLASSIFIED

MODEL PLANE DEALERS AND CLUBS—Write for our offer on the sensational model announced on page 58. Lawrence W. Brown Aircraft Company, Model Plane Division, Box 5A, Willowbrook, California.

WANTED—LATE plane, typewriter duplicator, adding machine, for cash. Pruitt, 170 North La Salle, Chicago.

BARTER and EXCHANGE

The publishers reserve the right to reject any or all notices submitted. Only swaps allowed in this column, sales or purchases must be placed in classified department. Rate: 3 cents per word.

AIRPLANES

WANT—Lambert-powered aeroplane, monopup preferred. What have you?—Tony Dtradovec, 2212 S. 61st Court, Cicero, Ill.

WILL SWAP any kind gas or electric refrigerator, family size, brand new, never used, for a sport plane, one- or two-place, A-1 condition. Send photograph in first letter.—C. DeLong, 1830 Hope St., New Orleans, La.

MEAD GLIDER, flying. Sale or trade.—Peyton Autry, Boonville, Ind., 420 Oak Street.

WANTED—Barling NB 3 fuselage, covered or uncovered, licensed or unlicensed. Will pay cash.—George Dorris, Jr., 722 South Wilson, Bozeman, Mont.

WANTED—Lightplane, will swap Master Oscillator Power Amplifier short-wave phone transmitter employing Class "B" modulation, short-wave plug in coil receiver, power supplies, instruments, tubes, speakers, 32-volt to 110 AC converter, double-button microphone and other radio equipment. Swap for lightplane, kit or crack-up provided the material and workmanship are good. What do you have?—Ralph Costan, Box 397, Clifton, Texas.

FOR SALE OR TRADE—Corben Baby Ace, all instruments; total flying, eight hours. Less motor. $200 or light car.—N. J. Prejean, 2825 Proctor St., Port Arthur, Tex.

OX-5 Eaglerock, long-wing, 3-place biplane. Dismantled. Repaired by licensed mechanic. Motor in excellent condition. Will trade for car or what have you.—William H. Thomas, 215 Virginia Ave., Shenandoah Heights, Pennsylvania.

TRADE new 40 h.p. Church Mid-wing for Corben, or less motor for Corben kit. May add cash.—N. Esser, 6641 Alabama Ave., St. Louis, Missouri.

OX-5 Millerized, American Eagle, equipped with Goodyear airwheels, new covering furnished in green and gold. Struts and wires chrome plated. Motor just completely overhauled by Hickman Machine Shop, no time since. Ship licensed until Oct., 1935. Will trade for late car or cash.—Harold F. Alyea, Lowell, Indiana.

HAVE Heath NC 12970, licensed, single-place plane. Will trade for two-place plane or Velie engine or willing to pay cash for Velie engine alone.—A. P. Bogus, 4538 S. California Ave., Chicago, Ill.

BEAUTIFUL log hunting lodge with 4 acres on Lake of Woods. Good muskie fishing. Deer, moose, bear, ducks, geese, partridge. Will trade for small monoplane or good used car.—C. O. Laurie, Penasse, Minn.

TRADE Salmson 40 A-1 condition, 80 hours total time, together with propeller, speed ring, extra parts for—LeBlond 65, auto, Aeromarine LeBlond motor mount, OX Robin or what have you?—Harold Clobes, Fairfax, Minn.

WANTED AT ONCE! Two 1931, factory-built Heath Super Parasols. Have $175 cash or exchange for each ship. Send photo.—Berry's-Owen Flying Service, P. O. Box 616, South Boston, Va.

FOR TRADE—Kari-Keen Monoplane powered with Velie M-5 motor. Has Dual controls, new propeller, good flying condition. Trade for two-place Aeronca or similar lightplane.—Paul J. Hibbs, Box 244, Chanute, Kansas.

HAVE Heath, less covering and motor. Want navigation lights.—M. Polasky, P. O. Box 221, Byesville, Ohio

WILL exchange Smith aeroplane welding outfit complete, steel tubing, tie-rods, 2 30x5 wheels, bolts, clevis ends, pins, turnbuckles, complete blueprints, of sport plane flown by Bert Acosta, all for South Bend bench lathe complete.—Joseph Terle, 111-36 173rd St., Jamaica, N. Y.

TRADE latest Model 54 Winchester Hornet rifle, new condition, shot 47 times, for good OXX6 motor and prop. Also want 30x5 wheels, tires and tubes in good condition.—R. A. Ruback, 36 McClellan Ave., Amsterdam, N. Y.

WANT set of Miller overheads for OX-5. New or used. I have complete tail assembly, ailerons, gas tank, and other parts for Mono-Prep to trade or will pay cash.—Lester Simon, 316 Tyler Ave., Ridgeway, Pa.

WANTED—Velie M5 or LeBlond 60 engine. Cash or trade.—Max Gottfried, 1407 W. Nash St., Milwaukee, Wis.

WANTED—Austin motor (running condition). Have new Pioneer instruments—compasses, altimeters, turn-bank indicator, air-speeds, etc. Fuel pumps for J-5. New 3-cylinder Splitdorf mag. for Lawrence. What do you want?—Weber, 969 East 28th St., Brooklyn, N. Y.

WANTED—Glider parts! Lightplane parts in exchange.—J. Elmer, 120 Audubon Ave., Wayne, Pennsylvania.

AIRCRAFT PHOTOGRAPHS and negatives. Will buy, sell or trade. Have 2,400 shots with complete data on each.—Bobby McLarren, 706 S. Normandie St., Los Angeles, Calif.

HAVE blueprints for Heath Super Parasol sportplane for bolted type. Will trade for 74 Harley Davidson or Indian Chief or their two-cylinder motor.—John Brzezowski, Allegany R. D. No. 29, Darien Center, N. Y.

WANTED—Good used Harley Davidson 74 motor. Will trade propellers for same.—Lorenzen Propeller Company, Niles, Mich.

MOTORCYCLE motor wanted—suitable for iceboat; have taxidermy course; no junk wanted.—Henry M. Swenson, Beltagh Ave., Bellmore, N. Y.

TO TRADE—"York" saxophone, in excellent condition, for serviceable motorcycle. J. H. Moore, 138 S. Converse St., Spartanburg, S. C.

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GIFT SUBSCRIPTION

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Your Move!

(Continued from page 39)

moves, B makes four moves, A makes five moves, each player trying to "take" opponent on last move each time. After "take" or fifth move plays out, opponent starts off again with one move. Moves and turns may be same as permitted for the standard game.

An interesting variation of the game simulates airplane racing wherein the opponents start their airplanes at the same corner of a squared board or at opposite corners and race around the square, each player throwing a dice to determine how far he shall progress at each play. Usually the turn is counted as one move and as in real flying a considerable advantage is gained when one airplane passes another and is then able to cut in on the inner track.

Airplane games may be played with pieces or "men" consisting of cardboard squares slightly smaller than the marked-off squares of the playing board, the airplane silhouettes with suitable identification marking drawn in ink or color on the cardboard or the airplanes may be cut out in the correct shape.

A very dressy form of the game may be worked up with actual solid wood airplane scale models of about two-inch wing span played on a board squared off to correspond. The airplane game as described is copyrighted by the writer and will be on the market in various forms but permission is given to airplane model builders and aviation students to make up games for their own use but of course not for sale.

Description of the game is copyrighted with permission granted to POPULAR AVIATION for this publication but republication in any form without permission is forbidden.

END

Bristol Fighter

(Continued from page 41)

ceive elevator. The bottom panels together with landing-gear are cemented to lower longerons. Note how rear landing-gear struts project through center panel. The top panel with the center section struts are cemented into position. The remaining wing struts are cemented to their proper locations.

All other small details are clearly explained on the plan. Machine-gun turret is designed to revolve. Two types of propellers are shown on the plan. The flying propeller, which has fiber blades, has less r.p.m. in order that the model can fly a greater distance.

Too much care cannot be given to the construction of the propeller. It should be carefully adjusted until the best results are obtained.

Four to six strands of ⅛-inch flat rubber are sufficient to fly the model. A small amount of weight can be added to the nose in order to balance the model.

END

Barn Doors

(Continued from page 28)

In the light of development, we cannot afford to sacrifice too much to gain one-sided, unbalanced performance. Recent military experiments in England and France have proven that the two hundred and more miles an hour fighting planes were not as deadly as some of the crates that were flown in wartime.

In practice dog-fights, planes with a top speed of about a hundred and thirty figuratively blasted the high-speed fighters from the sky. Maneuverability did it. The slower planes with approximately one-fourth the radius of turn, could stunt inside the evolutions of the faster jobs.

In military planes, where landing speeds may be sacrificed to performance, a slow cruising speed is essential.

It can be achieved. The challenge is with the youth of America. The danger of the amateur aviator both to himself and others can be easily minimized. When they cooperate and free themselves from the fetters of grafting commercialism and once again are given the freedom of the sky trails, we shall see the results of the real experimenter.

END

LINCOLN TRAINED MEN Are Finding Good Pay Jobs in AVIATION

Airline pilots earn up to $500 a month. Airplane and Engine Mechanics also earn good pay. Let LINCOLN train you for success.

A Steady Demand for Lincoln Graduates!

Recent reports from the Lincoln employment department offer this proof of the demand for Lincoln-trained men: Claude L. Horton and Henry Canfield, during the past year, have been employed by the Indiana Air Service, South Bend, Ind. Vincent Hamilton employed as airplane mechanic with U. S. Marines. Verne Haag, employed with the Bendix-Stromberg Carburetor Co. James Gehrmann, Baltimore, Md., with Glenn L. Martin Co., has helped build nine Martin Bombers. Monroe Ebner employed at Municipal Airport, Austin, Texas, servicing airplanes. A. Christo, Istanbul, Turkey, mechanic with Istanbul-Angora airlines. Marco Aguirre and Alfonso Vasquez of Quito, Ecuador, received appointments as lieutenants in the Ecuadorian air corps.

These and many others have found profitable employment in aviation after completing their training in this world's best known school. This school is constantly in touch with the aviation industry, with a view of placing its graduates in trusted positions.

THERE WILL BE OPPORTUNITIES for thousands of new jobs made available by the great aviation development program of the U.S. Government. 10 million dollars recently appropriated! Millions more are planned by our government to make America first in the air! Why not be ready to fill one of these good jobs? Learn to fly all types of planes at LINCOLN. Primary and advanced flying taught; includes straight flying, blind flying by instrument, cross-country, spot landing, aerial navigation, aerodynamics, acrobatics, meteorology. Master Mechanic's Airplane and Engine course prepares you for mechanic's position.

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offered for a limited time to help ambitious men earn their living expenses while training. Hurry!

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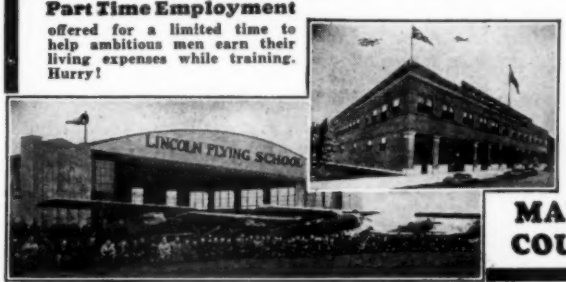
● Recognized internationally for turning out the better-trained Pilots and Mechanics for the better aviation jobs. From Scotland, South Africa, Canada, Alaska, China, and from nearly every state in this country have come students to LINCOLN to get proper training that leads to success.

● The Lincoln Airplane and Flying Schools pictured here are among the finest in America. 24 years' success as mechanics' trade school and 14 years teaching aviation stand behind them.



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